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Forecasting the Future: How Television Weathercasters' Attitudes and Beliefs about Climate Change Affect Their Cognitive Knowledge on the Science

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Abstract

The topic of climate change has recently resurfaced on many news agendas, but increasingly the scientific and political issues mix. Previous research has noted that even though the public relies primarily on television news as a source of climate change information, broadcasting has few environment and/or science reporters to cover the topic. This study considers another potential source--television weathercasters. This research measures weathercasters' acquired climate change knowledge against the scientific consensus and analyzes differences in their knowledge based on several factors that may influence their climate change reporting. Results show that the TV weathercasters with the most accurate climate change knowledge scored highest in the affective domain--that is, the attitudes and values they hold about this scientific concept influenced their cognitive understanding of the topic more than any other independent variable. Put more simply----the "politics" of what some consider a controversial scientific topic had the greatest bearing on weathercasters' scientific knowledge.

Forecasting the Future: How Television Weathercasters' Attitudes and Beliefs about Climate Change Affect Their Cognitive Knowledge on the Science

Creating Scientific Consensus

While media coverage of global warming didn't really begin until 1988, the research on the science of increased greenhouse gases in our atmosphere dates all the way back to the 19th century. As industrialization was sweeping across the Northern Hemisphere, a Nobel-prize-winning chemist from Sweden first hypothesized about the impacts of more carbon dioxide in the atmosphere (Arrenhius, 1896). His research estimated a global temperature increase of 4-6°C would result from a doubling of industrial emissions. While the technological tools have become more sophisticated and the temperature estimate has been refined over the last 100 plus years, the basic science has remained the same.

Climate modeling got an inadvertent boost in the 1950s Cold War era out of fears that the Soviet Union was modifying global climate (Victor, 1995). In 1965, the President's Science Advisory Committee published the first government report to recognize that climate change could be caused by human activities and that this would have important consequences for the world (PSAC, 1965). Two years later, a numerical model of the atmosphere predicted that doubled carbon dioxide content in the atmosphere should raise the average surface temperature of Earth 1.5°C-3°C (Manabe and Weatherald, 1967). More than 100 independent estimates of average surface temperature were made between the mid 1960's and the mid 1980's and all predicted temperate increases within the range of 1.5°C to 4.5°C with a doubling of greenhouse gases (Schlesinger and Mitchell, 1985). Since then,

multiple model enhancements and three international panels comprised of thousands of leading scientists have concluded much the same. The third report of the Intergovernmental Panel on Climate Change (IPCC, 2001) projects that globally averaged surface temperatures will rise 1.4 to 5.8°C this century. While the low end of the predicted temperature increase has remained largely the same throughout the advances and changes in modeling, the high end has gone through several modifications, with this new estimate of 5.8°C being higher than in the two previous IPCC reports.

Initially the press was not very interested in the atmospheric research on a doubling of carbon dioxide (Kellogg, 1988)—that took the serendipitous confluence of extreme weather events, combined with the release of new data, to take the theory of global warming from the laboratories and science journals and thrust it onto the media agenda.

The climate of Earth has always fluctuated, so the task of separating the "signal" of anthropogenic warming amid the "noise" of the natural variability is extremely complex. Scientists around the globe are using large computers and esoteric programming to try and model both the current and predicted climate of the future. These general circulation Models (GCMs) are three-dimensional representations of the atmosphere that involve hundreds of thousands of separate equations (MacDonald, 1989). Although the models do show consistency with respect to increasing global temperatures, cloud cover and precipitation, regional predictions remain problematic because of the large grid size used in the GCM's.

The IPCC was formed by the United Nations to synthesize scientific consensus. The principal finding in its report was that a "discernable global warming has occurred and it may be due to anthropogenic causes" (IPCC, 1995). The second report considered regional analyses of climate trends, future climate scenarios and the impact for human and natural systems and was comprised of more biologists and geologists (IPCC, 1998).

The third assessment included more than 1200 multi-national scientists from 23 science disciplines that produced three separate working group documents, each more than

1,000 pages. In addition to considering "improved analysis of data sets and comparisons among data from different sources that have led to a greater understanding of climate change," (IPCC, 2001) more emphasis was also placed on the social aspects of potential climate change. Scientists were told to be "policy-relevant not policy- prescriptive" in their report. In other words they were encouraged not to tell policymakers what to do about potential climate change, but rather to provide "likely" scenarios in lay language that they can understand and assimilate. While the ersatz separation of the science from the politics sounds like good practice, research, including results from this study, suggests that this is difficult with this highly charged topic. And some scientists charge the IPCC itself with being "too political" (Lindzen, 2001).

The IPCC reports represent scientific consensus, a term that creates confusion among scientists themselves, let alone journalists covering them. Scientists often accuse journalists of making science more certain than it is by eliminating important caveats, but the limited research to date suggests that journalists often also make science seem far less certain, often out of ignorance (Stocking, 1999). Some aspects of climate change science are considered certainties: The theory of the greenhouse effect itself is the most well-established certainty in all of atmospheric science (Kellogg, 1991) and is not debated, although the large majority of weathercasters in this survey believed it still was. Dramatic increases in greenhouse gas concentrations, including a 31% increase in carbon dioxide since 1750 (IPCC, 2001) are also considered certain science.

The next level of agreement is consensus, meaning there is large agreement among scientists about the findings, but still some unknowns. Consider this statement of attribution in the 2001 IPCC report: "In the light of new evidence and taking into account the remaining uncertainties, most of the observed warming in the last 50 years is LIKELY (author emphasis added) to have been due to the increase in greenhouse gas concentrations ..... and the balance of evidence suggests a discernable human influence." Scientific consensus also occurs with regards to the measured 0.6°C increase in global surface

temperature since 1861, when instrumentation began. Certainty is limited due to changes in measuring techniques, expansion of urban heat islands, and vast areas of oceans without complete data, yet this panel of expert scientists considers the temperature increase real. Nine of the ten warmest years in recorded history have occurred since 1988, and 2001 was the planet's second hottest on record (National Climate Data Center, 2002).

Uncertainties are greatest in the realm of future predicted effects. The models lack the precision and specificity to accurately foresee all of the future, especially regionally, and that is where much of the media attention, scientific debate and political squabbling are focused. As mentioned above, all the models agree on global increases in temperature, cloud cover, and precipitation, but *where* these will occur and what the impacts of these changes will be, are not possible to discern with certainty using current models. The IPCC acknowledges "improved methods of processing data," and some scientists are optimistic that kind of sophistication is only a few years away. Although, predicted future effects are problematic, that doesn't mean the entire science of climate change is clouded with uncertainty.

Science is not a popularity contest and many important minority views have later been proven correct (Ellsaesser, 1991), but quality media reporting on climate change needs to accurately portray both the scientific consensus and dissent. Instead of correctly understanding where (and why) the scientific debate occurs, TV weathercasters in this survey appeared confused often exaggerating the debate and underplaying the consensus.

Climate Change and the Media

While no scholarly research currently exists on TV weathercasters and climate change, research about media coverage in general does provide some context for why this study was conducted and how it adds to the literature.

While many people credit The New York Times for publishing the first article on the "greenhouse effect" (August 22, 1981), a recent historical book uncovered the topic of

"global warming" being reported in the Saturday Evening Post as early as 1950 (Fleming, 1998). Most news operations didn't broach the subject until the summer of 1988; when NASA scientist James Hansen testified before Congress about the increasing evidence of global warming, while the U.S. was embroiled in an extended heat wave and drought that many scientists and journalists used as "hooks" for the story.

Hansen never said that increased greenhouse gases had caused the record warmth and drought of 1988, but according to some scientists, that inference was drawn and widely reported in the media (Schneider, 1990). In the wake of such coverage a greenhouse backlash was created. Scientists who believed there was much uncertainty about the effects of greenhouse gas buildup increasingly came forward to express "some coolness concerning global warming." (Lindzen, 1989). Other scientists suggested that the press had spent too much time focusing on statements by a handful of global warming skeptics (Lashoff, 1990). One study found that this controversy among scientists received greater attention during the maintenance and downside of the attention cycle to global warming (McComas and Shanahan, 1999), but the lingering effects of this "dueling scientists" debate were easily discerned among both reporters and TV weathercasters in these surveys.

Journalists struggle with the terminology of the science of climate change. Science writers used the term "greenhouse effect" as a label, while non-science writers preferred the term "global warming" (Wilkins, 1993). Later research discovered that these kinds of differences in media portrayals were partially responsible for knowledge disparities noted among a population of college students (Wilson, 1995).

U.S. news reporting on global climate change peaked in 1988 (Trumbo, 1995), declined in the early 1990s, and then resurfaced on most news agendas in late 1997. Several possible explanations exist for this rise and fall in coverage. Ungar (1995) argues that global warming reporting declined because of the inability of the topic to sustain the status of a dramatic crisis. Other research posits that the dramatic narratives media constructed drove the change in reporting (McComas and Shanahan, 1999). Mazur and Lee

(1993) found that in most cases drama rather than science had also played a role in bringing the ozone depletion story to the media's attention. Events such as the Kyoto Summit and El Niño's dramatic return and its resulting weather effects, may also partially explain the reemergence of climate change reporting, as well as the on-going reporting on the scientific debate, which enhances the drama of the story at the expense of the science.

Fluctuation in coverage could also result from what Downs (1972) first identified as the issue-attention cycle of reporting of environmental issues. In his model Downs identifies five stages in the life of an environmental issue: Pre-problem; Alarmed discovery and euphoric enthusiasm; Realizing the cost; Gradual decline of interest; and Post-problem. Trumbo (1996) expanded Down's ideas and applied them to climate change reporting to identify the first three distinct phases in the media coverage. Scientists were the primary sources in the early stages of climate change reporting when the framing of the story was defining the problems and diagnosing the causes. As politicians and interest groups were increasingly successful in making their claims, they changed the framing of the story toward making judgments and suggesting remedies (Trumbo, 1996). Results of this survey indicate that the politicizing of climate change has had a dramatic, deleterious impact on the ability of some weathercasters to communicate accurately about the science.

Wilkins (1990) was one of the first to consider the mix of science and politics in climate change reporting. She found that good science writers covered the scientific aspects of the story well, but missed the political nuances. Political reporting reflected the same problem: because the science was not covered well, the politics lost its edge. Ungar discovered that peaks in climate change reporting were not pegged to dramatic weather-related events, but rather stories about the politics of the Bush Administration, Rio Earth Summit and Kyoto Protocol (Ungar, 1999).

Use of sources was also discovered to have a direct impact on reporters' knowledge about climate change (Wilson, 2000). In that study, climate change knowledge was most accurate among the minority of reporters who primarily used scientists, instead of other

media, as sources, as well as among those who worked on the science/environment beat full time. Findings from this current study suggest that sources have little impact on the acquired climate change knowledge of TV weathercasters.

There are very few full-time science/environment specialists, especially in television, the medium with the greatest reach, and that was one genesis for this research---to consider other potential broadcast sources of information. Only 7% of these weathercasters say their station has an environment/science reporter. Given the public's preference for TV as a primary news source (Roper, 1998), TV weathercasters are an unstudied and perhaps important source of climate change information.

Research Goals

To build on the findings of previous research and provide insights into some of the gaps in the media dissemination of climate change information, the goals of this study were threefold:

1: To identify sources of weathercasters' climate change knowledge.

2: To measure this knowledge and identify conceptual gaps in knowledge.

3: To analyze differences in this knowledge based on a set of variables, including educational background, staff position, market size, use of sources, acquisition of meteorological "seals of approval", and attitudes and values about climate change.

Method

A four-page survey was mailed to 445 randomly selected local television weathercasters. The Broadcasting and Cable Yearbook was used to identify all network affiliates and independent stations in the United States with local newscasts. A rotating system of primetime/main anchor, morning/noon anchor, and weekend weather anchor was then used to identify one person at each station to receive the survey. Once the position was

selected, a personal phone call was made to the station to get the correct name and spelling of the person currently in that position. Then a survey specifically addressed to that person was mailed along with a cover letter identifying the investigator and the reasons for the inquiry.

A total of 217 TV weathercasters responded to the survey for a response rate of 48.8%. This is a very high response given that it was a one-time mailing and no postcard reminders were mailed out. Survey research typically garners a response rate between 19-27% with postcard follow-ups (Dillman, 1978). No code numbers were used on the surveys to insure confidentiality and anonymity, which contributed to the higher response rate. The goal of a probability sample is a systematic selection procedure to represent the universe with a minimum of sampling error. This is one the largest such surveys of TV weathercasters ever conducted, and provides some valuable insight into this profession's ability to communicate about this important scientific topic.

The sample has an excellent distribution among key variables. Half of the respondents are primetime anchors/chief meteorologists and the other half work weekends and noon/mornings. Half (108) hold the American Meteorological Society (AMS) seal of approval, while a quarter of the sample have earned the National Weather Association (NWA) seal of approval (nine percent hold both seals) and the remainder have neither of the voluntary credentials that on-air weathercasters can earn. The sample also includes a broad distribution among market sizes, with 22% from top 25 markets, 16% in markets 26-50, 32% in markets 51-100 and another 30% in markets 101 and smaller. In all, 127 television markets are represented in the sample. More than half the respondents hold degrees in meteorology/atmospheric science, while a quarter of the weathercasters' degrees are in journalism/communications. The remainder have a mix of training and education. All of these factors allowed for optimal statistical analyses between and among groups of independent variables.

Cognitive knowledge about climate change was measured using 76 multiple-choice questions. "I don't know" was included as an option to more directly measure weathercasters' ignorance about a topic. They were encouraged to use that option rather than randomly guessing to hide lack of knowledge (Converse, 1984). Ignorance, in the sense of absence of scientific knowledge, is another concept in need of scholar's attention (Stocking, 1999) and this study analyzed accurate, incorrect and "I don't know" (ignorance) responses as proposed by Smithson (1989). The questions were developed using the consensus report of the Intergovernmental Panel on Climate Change (IPCC) and tested for accuracy with a national panel of atmospheric scientists. Knowledge was measured in four content areas: 1) scientific context, 2) greenhouse gases, 3) sources of increased greenhouse gas emissions, and 4) predicted effects of climate change. An overall total knowledge and ignorance score for the entire test was also calculated and reported in table form.

Because the political aspects of global climate change are so intricately woven with the science, a series of Likert scale questions ranging from "strongly agree," to "strongly disagree" were also used to query weathercasters' attitudes and values. The design and purpose of these questions enabled an analysis of what Bloom (1956) first identified as the affective domain of knowledge. This is especially pertinent to learning from television, where research indicates that television is most effective at transferring attitudes and beliefs (Philo, 1990). Bloom's taxonomy argues that attitudes and values must also be considered as part of the learning process, and in the case of this survey of television weathercasters, yielded the most dramatic findings.

Results and Discussion

1. Sources of Weathercaster Knowledge about Climate Change

Unlike reporters who said they primarily relied on other mediated sources (newspapers) for their climate change knowledge, these weathercasters said they primarily

used scientific journals (28%) and scientists (26%) as sources. This is a striking shift in the use of sources. Perhaps one reason this occurs is that on-air meteorologists working in a science discipline feel more comfortable using scientific sources. Reporters often cite the difficulty in approaching scientists as a constraint to their reporting (Dunwoody, 1986), but clearly many TV weathercasters don't share this apprehension. This sample reported only small use of other media (8% combined for print, TV and internet sources), in sharp contrast to environmental reporters' primary use of media as climate change sources (Wilson, 2000).

2. Weathercasters' Knowledge about Climate Change

All 217 weathercasters (100%) were familiar with the term global warming, but follow up questions uncovered large variability in accurate acquired knowledge. To examine the relationship between the individual predictors and weathercasters' knowledge, ten summary scores were created (Table 1). Four summary scores represent weathercasters' accuracy to the survey questions in each of the four content areas. An additional four summary scores were created to represent weathercasters' lack of knowledge/ignorance ("I don't know" responses). There were five dimensions to each aspect of knowledge as denoted by the content areas: Scientific Context, Knowledge of Greenhouse Gases, Knowledge of Increased Greenhouse Gas Emissions, Knowledge of Predicted Effects, and Total Knowledge Index. The Total Knowledge Index represents the sum of the four other dimensions. Table 1 shows the means, standard deviations, and alpha coefficients for each score. Overall, reliabilities are good except for scientific context, which will be elaborated on later, indicating consistency of responses within the domains. More variation occurs in the ignorance index, implying that despite the "I don't know option" some weathercasters were more willing to admit their ignorance than others.

Table 2 shows the interconnections between the dependent variables, demonstrating consistent relationships between knowledge and ignorance—as accuracy increases,

ignorance is reduced. All correlations were statistically significant at $p < .01$. Weathercaster responses were consistent within and across knowledge domains. Those with higher accuracy in the area of scientific context, for instance, also showed higher knowledge in other content areas.

Highlighting some findings within the content areas: Carbon dioxide was correctly identified as a greenhouse gas by 80% of the weathercasters and methane by 63%. Weathercasters did not perform as well in recognizing other important greenhouse gases such as CFCs (56%) and nitrous oxide (22%). Most weathercasters were knowledgeable about sources of increased greenhouse emissions related to carbon dioxide, including auto emissions (87%) and deforestation (65%), but were substantially less aware of sources related to other greenhouse gases—such as landfills (25%) and rice agriculture (13%) associated with methane, and air conditioning leaks (47%) related to the release of CFCs.

Surprisingly, all of these numbers are lower than reporter responses to the same questions a few years earlier.

This sample of weathercasters also demonstrated serious misconceptions about the scientific consensus regarding predictions of climate modeling. Most weathercasters were aware of the scientific consensus of a global temperature increase (73%), although nearly a quarter answered, "I don't know." Only a third accurately identified the models' agreement on an increase in global cloud cover (35%) and global precipitation increase (34%) with a doubling of greenhouse gases. These statistics are startling, given that all atmospheric models agree on these predictions and they represent basic atmospheric science that weathercasters' work with daily. In a warmer world, more evaporation will occur, which will increase cloud cover, which will lead to more global precipitation. This is basic meteorology, yet apparently misunderstood by two-thirds of these television weathercasters. It was expected that TV weathercasters, who use many similar models in their forecasting activities, would understand climate models better than reporters or the public, but the results from this survey did not support such a hypothesis.

All general circulation models predict a global-scale warming with increased greenhouse gases in the atmosphere. The range of that warming reflected in the scientific consensus reported by the IPCC has a lot to do with how the increase in cloudiness is treated in the equations (as well as oceans, ice, soil and vegetation). A positive feedback in the modeling creates more cirrus clouds on balance, which allow the sun's energy to enter the earth's atmosphere and also act to trap heat, exacerbating any warming. If more low level stratus clouds are created, less of the sun's energy reaches the surface creating a negative feedback and reducing the predicted warming. But all models predict more clouds and precipitation on a global-scale.

Like the reporters before them, many weathercasters also tended to ascribe scientific agreement where it does NOT exist by overestimating the scientific consensus about increased drought and hotter summers in the U.S. While such speculation much seem intuitive with the theory of "global warming," current climate modeling does not yet provide such specificity for regional predictions. Kempton (1997) found these misconceptions were shared in a sample of voters as well, and while not tested in his research, may have resulted from media coverage. Many people are unable to distinguish between the concepts of climate, which refers to long-term, stable patterns, and weather, which is short-term and highly variable. But the fact that weathercasters, whose daily lives revolve around such nuances, are unable to do so is a bit surprising. 93% of the weathercasters disagreed with a later statement in the survey that "weather and climate are the same thing," but many of them are confused about these concepts when applied to the predicted effects of increased greenhouse gases. Clearly, something is contaminating their understanding of the science of their discipline.

Some preliminary clues to this influence can be found in the first knowledge area. The coefficient alpha was lowest in the area of scientific context (Table 1), suggesting some problems with survey questions in this portion of the instrument, or perhaps with weathercasters' understanding of the concepts associated with the science of climate

change. Only 22% of weathercasters correctly acknowledged that the theory of global warming is accepted by most atmospheric scientists. Most weathercasters (58%) thought the topic was still strongly debated among these specialists. The greenhouse effect is a scientific certainty; but less than half (44%)of all TV weathercasters knew this fact.

Weathercasters also scored poorly in three of the other four contextual measures in the survey related to Earth's current temperature, as well as the scientific agreement on predicted global temperature increase. Seventy percent of weathercasters accurately identified the scientific consensus that Earth's surface temperature has indeed increased in the last 100 years. But only 13% were able to identify the range of predicted temperature increase. The largest percentage (35%) mistakenly thought there was no scientific consensus on a global temperature increase.

As these numbers indicate, significant numbers of weathercasters were ignorant or misinformed about these contextual measures that assist in making connections to on-going climate change research. Even though a majority of these weathercasters said they used scientists and science journals to primarily inform them about this topic, which was previously demonstrated to positively increase knowledge about climate change, something plainly is negating this practice. Discovering why this is occurring is one of the goals of the next section.

3. Factors Affecting Weathercaster Knowledge about Climate Change

The same four content knowledge areas were used for this analysis, as well as the Total Knowledge Index. To test which weathercaster characteristics would best predict knowledge outcomes, a set of hierarchical multiple linear regressions were conducted. The following demographic predictors were included on Step 1: staff position (primary anchor or other), educational background, and market size. It was expected that those

weathercasters who had risen in their careers to larger markets and/or primary anchors and who had science degrees would possess better knowledge than other weathercasters.

On Step 2, predictors were entered representing whether weathercasters had earned seals of approval from either the American Meteorological Society (AMS) and/or National Weather Association (NWA). Again, the expectation was that those who had passed meteorological exams and certification required to earn these seals would have more accurate climate change knowledge than those who had not earned these credentials. By entering the seal characteristics on Step 2, the regression model tests variation in their knowledge after controlling for position, education and market size characteristics in Step 1.

Step 3 included six variables representing TV weathercasters' attitudes and beliefs about climate change as measured with Likert scale questions in the survey. The questions asked weathercasters to choose among a five-point scale of "strongly agree" to "strongly disagree" to the statements. A negative number in the table represents disagreement with the statement.

Table 3 shows the individual standardized regression coefficients (Beta's) for the predictors and the incremental R-squared values for the three blocks of variables along with the Overall R-squared values for the entire model using the five knowledge accuracy scores as dependent variables. Overall, very few of the variables in Step 1 and Step 2 had the expected impact on TV weathercasters' knowledge (Table 3). For example, the seven predictors in Step 1 explain about 9% of the variation in weathercaster accuracy in the domain of scientific context, and 8% of the variation in total knowledge, but none of the individual predictors exhibited statistical significance. Having a meteorology degree was the most consistent predictor of accurate climate change knowledge in Step 1, but again it was not statistically significant by itself. Surprisingly, market size and seniority in the business and on the weather staff had no statistical effect on climate change knowledge, which challenges one of the basic tenets of television that the best in the business rise to senior positions in larger markets.

Step 2 characteristics explain none of the variation in weathercaster knowledge. Only in the area of predicted effects did having a seal (AMS) positively predict an increase in accurate knowledge, but overall neither seal had any statistical significance on climate knowledge. This may be especially distressing to those organizations that administer these seal programs and require extensive testing and certification to earn the distinction of "seal of approval." While not directly testing for climatological knowledge, the seals require meteorological training that covers many of the same issues presented earlier. A separate study is measuring the perceived value of these voluntary seals, and indicates there is strong debate among weathercasters about the difference between, and the value of the two seals, but it appears that neither seal is a reliable predictor in itself of accurate weathercaster knowledge about climate change.

While expecting more significant findings in the first two steps and not finding them, the strongest predictors explaining variation in TV weathercaster knowledge were consistently found in their attitudes and values about the topic of climate change, even after controlling for those factors in the previous analyses. These questions measured the affective domain and results indicate they had the largest bearing on these weathercasters' cognitive knowledge. Before analyzing the multiple regression results, responses to each of the questions are first discussed to provide some context for the analysis.

Three quarters of the weathercasters agreed that, "Climate change is a serious environmental issue." Fewer than five percent disagreed with the statement. More than 93% of them accurately acknowledged that climate and weather are distinct concepts, while three percent thought the terms were the same. More than half of the respondents (57%) believed " I understand the science of climate change," while only 12% thought they did not. The accuracy of their responses in this survey, however, contradicts this belief as many weathercasters actually have distorted understandings of the science. A third of the sample felt neutral in responding to this question, perhaps indicating that many weathercasters believe they understand some aspects of the science while being ignorant of others. These

Likert questions were asked at the end of the survey, after weathercasters had answered the cognitive knowledge questions, perhaps also giving some of them an insight into the breadth and depth of climate change concepts they may not have considered before.

These television weathercasters were evenly split about whether their broadcasts are "the proper place to educate about environmental issues such as climate change." More than 40% agreed with the statement, 30% disagreed, and 28% felt neutral about using their weather broadcasts to educate about climate change. In follow-up interviews, many television weathercasters bristled at the word "educate," which many do not feel is their job or purvey, which may have unintentionally complicated the results to this question. Weathercasters' answers to these preceding questions had no statistical impact on their climate change accuracy or ignorance.

Finally, the remaining questions asked respondents to comment on changes in local weather, their area of expertise, and their responses here had the greatest influence on their climate change knowledge. Weathercasters were evenly divided in their responses to "Variations in weather are becoming increasingly common." Only a third agreed with the statement, which is supported by IPCC findings. Almost the same number disagreed with the statement. What these questions can't discriminate is whether these responses are linked to variations in weather in specific locales based on personal experiences of the individual weathercaster, or based on the climate change research. The third of weathercasters who answered this question correctly had more accurate climate change knowledge overall.

A follow-up question gets to the debate over these increasing changes in weather and asked respondents if these "local variations are symptomatic of global climate change." A majority (53%) accurately disagreed with the statement, and only nine percent mistakenly take the research beyond its current capabilities to ascribe local, regional effects not yet linked to climate change. The single largest group of respondents (38%) did not know.

Each of these questions was used in Step 3 of the hierarchical multiple regression model to measure their potential impact on weathercaster accuracy and ignorance of climate change knowledge. The significance is greatest in accurate knowledge of greenhouse gases and total knowledge ($p < .001$), but occurs in all five content areas (Table 3). The negative relationship found in four of the content areas with the statement, "Variations in local weather" indicate TV weathercaster disagreement and an accurate response. No credible scientist claims the ability to ascribe a particular weather event to global climate change, and those weathercasters who knew that had more accurate climate change knowledge.

The same kind of statistical significance occurs with those weathercasters who agree that "Variations in local weather are becoming increasingly common" in the content areas of knowledge of greenhouse gases and total knowledge. Those weathercasters that acknowledge this is occurring have a more accurate understanding of the science. Finally, those weathercasters who possess the attitude that "I understand the science of climate change," actually do better in four of the content areas with statistical significance of $p < .01$ in total knowledge. This subjective feeling of being well informed (Miller, 1986) actually proves true with these TV weathercasters.

Overall the predictors explain 23% of the variation in accurate weathercaster knowledge, which is statistically significant ($p < .001$).

A similar set of hierarchical multiple regressions was performed using the five ignorance scores as dependent variables. Table 4 shows the individual standardized regression coefficients (Beta's) for the predictors and the incremental R-squared values for the three blocks of variables along with the Overall R-squared values for the entire model. Overall, the same predictors of accuracy were also the most consistent statistically significant predictors of ignorance.

Conclusions

Public understanding of science is critical in a society increasingly affected by its impacts and its related policy implications (Nelkin, 1987). The world's leading scientists acknowledge the vital role of a well-informed public in order to set appropriate climate change policy (IPCC, 1995). Today, the media are the most common source of such scientific information. The media were the sole source of information on climate change for most New Zealanders (Bell, 1994), and in the United States, the media, especially television, were also identified as the primary source of climate change knowledge (Wilson, 1995). This research has addressed another area of mediated climate change information that had yet to be considered--the role of television weathercasters. Previous content analyses helped understand *how* media covered climate change, while this study attempts to add to the literature on *why* this reporting is occurring.

The results from this research suggest that despite the best intentions of the IPCC and other scientists, the political aspects of climate change are not easily separated from the science. Even among this group of specialists in atmospheric science, widespread ignorance and misinformation of basic climate change science is evident, and as the data describe, much of that can be connected to the values and beliefs that weathercasters hold about the topic. These results substantiate other recent findings about the power of people's "feelings" (affective domain) over knowledge in public support for biotechnology (Priest, 2001).

Solutions to this dilemma are not easily rendered. Recommending that reporters go to scientists and science journals, instead of other media as primary sources of knowledge, as suggested in previous research, does not apply here. These weathercasters say they are already using those preferred sources, and yet the distortion of their scientific knowledge persists. Previous research also found that full-time science/environment reporters had more accurate climate change knowledge than other reporters, and it was recommended that increasing their numbers and status might also improve reporting. However, the TV

weathercasters in this survey are already full-time, and the data show that being primary anchor in the largest market or weekend anchor in the smallest market had no statistical impact on their climate change knowledge. Neither did possessing either of the two coveted seals of approval, suggesting that more training and education alone may also not address the disparity in accurate knowledge.

The mixing of climate change science and politics seems to have had a special impact on TV weathercasters. As one example, the Clinton administration inadvertently exacerbated the perceived politicizing of the climate change issue among TV weathercasters. One hundred of them received personal invitations from then Vice- President Al Gore to attend a climate change summit at the White House in 1997. While many appreciated the invitation and the exposure, many others who attended were offended that a politician dare attempt to educate them on such a topic. Others who weren't invited considered this a professional snub. The net result is that many TV weathercasters feel that Washington politicians are attempting to skew the scientific data on climate change for their own purposes, meanwhile ironically oblivious to their own misperceptions of the science. At professional meetings, a consistent and vocal minority of TV weathercasters expresses outrage when confronted with the scientific certainty and consensus regarding climate change, often couching their comments in political terms that defy and contradict their science training. One aspect this study design did not consider was the age of the weathercasters. Anecdotal evidence has led some to suggest a generation gap hypothesis as one more explanation for the disparity in TV weathercasters' understanding of the science of climate change. While no one has analyzed this potential variable, many within in the weathercaster community suspect that older weathercasters are much more skeptical of climate change research.

Many TV weathercasters create dissent in areas where science agrees, unnecessarily flaming the debate. Their misunderstandings of some of the basic principles of meteorology that also apply to climate change are baffling and ultimately can be explained

in this sample by their own politicizing of the science. New strategies to overcome these obstacles will need to be considered in addition to the remedies previously recommended for other journalists.

One study currently being conducted by this author analyzes TV weathercasters' use of video interviews and b-roll provided by a scientific organization. Hundreds of TV weathercasters took advantage of this service and analyzing how the video materials were used in the broadcasts may provide some further insights. Another study being proposed would conduct extensive interviews with TV weathercasters to gather qualitative data to complement the quantitative findings presented here. Ultimately, the goals of further research are to continue to uncover why many TV weathercasters have difficulty grappling with the science of climate change and to devise effective strategies to improve their crucial contribution to the public communication of science.

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To examine the relationships between the individual predictors and weathercasters' knowledge, ten summary scores were created. Five summary scores represent weathercasters' accuracy in responding to questions represented by a correct answer. An additional five summary scores were created to represent weathercasters' lack of knowledge. There were five dimensions to each aspect of knowledge: SCIENTIFIC CONTEXT, KNOWLEDGE OF GREENHOUSE GASES, KNOWLEDGE OF INCREASE IN GREENHOUSE EMISSIONS, KNOWLEDGE OF PREDICTED EFFECTS, and TOTAL KNOWLEDGE INDEX. The Total Knowledge Index represents the sum of the four other dimensions. Table 1 shows the means, standard deviations, and coefficient alphas for each score. Overall, most reliabilities appear adequate except for scientific context.

Table 1

Outcome	Mean	Std Deviation	Alpha
ACCURACY OF SCIENTIFIC CONTEXT	2.69	1.05	.22
IGNORANCE OF SCIENTIFIC CONTEXT	.97	1.02	.40
ACCURACY OF KNOWLEDGE OF GREENHOUSE GASES	4.00	2.04	.67
IGNORANCE OF GREENHOUSE GASES	2.84	2.41	.80
ACCURACY OF KNOWLEDGE OF INCREASE IN GREENHOUSE EMISSIONS	5.59	2.43	.68
IGNORANCE OF INCREASE IN GREENHOUSE EMISSIONS	4.04	3.07	.83
KNOWLEDGE OF PREDICTED EFFECTS	2.05	1.88	.78
IGNORANCE OF PREDICTED EFFECTS	4.08	2.44	.86
TOTAL KNOWLEDGE INDEX	14.33	5.53	.80
TOTAL IGNORANCE INDEX	11.94	7.03	.87

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Table 2 shows the intercorrelations between the ten scores. All correlations were statistically significant.

Table 2: Correlations among independent variables

Correlations**	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) ACCURACY OF SCIENTIFIC CONTEXT	1.00									
(2) IGNORANCE OF SCIENTIFIC CONTEXT	-0.63	1.00								
(3) ACCURACY OF KNOWLEDGE OF GREENHOUSE GASES	0.41	-0.36	1.00							
(4) IGNORANCE OF KNOWLEDGE GREENHOUSE GASES	-0.39	0.34	-0.85	1.00						
(5) ACCURACY OF KNOWLEDGE OF INCREASE IN GREENHOUSE EMISSIONS	0.34	-0.28	0.60	-0.58	1.00					
(6) IGNORANCE OF INCREASE IN GREENHOUSE EMISSIONS	-0.41	0.37	-0.62	0.71	-0.83	1.00				
(7) KNOWLEDGE OF PREDICTED EFFECTS	0.41	-0.39	0.30	-0.34	0.29	-0.41	1.00			
(8) IGNORANCE OF PREDICTED EFFECTS	-0.39	0.38	-0.33	0.39	-0.31	0.42	-0.87	1.00		
(9) TOTAL KNOWLEDGE INDEX	0.63	-0.51	0.81	-0.75	0.82	-0.81	0.66	-0.63	1.00	
(10) TOTAL IGNORANCE INDEX	-0.54	0.56	-0.73	0.84	-0.71	0.88	-0.65	0.72	-0.91	1.00
Note: All correlations were significant at $p < .01$										

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Table 3: Hierarchical Multiple Regression using Accuracy Indexes as Dependent Variables

	ACCURACY OF SCIENTIFIC CONTEXT		ACCURACY OF KNOWLEDGE OF GREENHOUSE GASES		ACCURACY OF KNOWLEDGE OF INCREASE IN GREENHOUSE EMISSIONS		KNOWLEDGE OF PREDICTED EFFECTS		TOTAL KNOWLEDGE INDEX	
Equation	Standardized Beta Coefficient	Change in R^2	Standardized Beta Coefficient	Change in R^2	Standardized Beta Coefficient	Change in R^2	Standardized Beta Coefficient	Change in R^2	Standardized Beta Coefficient	Change in R^2
Step 1		.086*		.05		.03		.09*		.08*
Primary Anchor	.00		.09		-.08		.02		.01	
Other anchor	.05		.03		-.04		.00		.00	
Meteorology Degree	.02		.17		.17		.08		.17	
Journalism Degree	-.17		.03		.09		-.07		-.01	
Other science degree	.03		.14		.08		-.07		.06	
Journalism and Science Degree	-.03		.03		.07		-.06		.01	
Market Size	-.02		.06		.09		-.02		.05	
Step 2				.01		.00		.03		.01
AMS seal	.16		.01		.06		.18*		.13	
NWA seal	-.06		.11		-.01		.07		.05	
Step 3		.07*		.07*		.12***		.10**		.14***
Climate change is a serious issue	.08		.10		.11		-.02		.10	
Weathercast is the proper place to educate	-.03		.09		.09		-.01		.06	
Variations becoming increasingly common.	.15		.11		.24*		.23*		.26**	
Variations symptomatic of climate change	.01		-.29**		-.26*		-.13		-.27**	
Weather & climate are the same thing	-.05		.00		-.10		-.12		-.10	
I understand the science of climate change	.19*		.12		.18*		.24*		.25**	
Total R-Squared		0.17**		0.13		.15*		.22***		.23***

* p < .05 ** p < .01 *** p < .001

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Table 4: Hierarchical Multiple Regression using Ignorance Indexes as Dependent Variables .

	IGNORANCE OF SCIENTIFIC CONTEXT		IGNORANCE OF GREENHOUSE GASES		IGNORANCE OF INCREASE IN GREENHOUSE EMISSIONS		IGNORANCE OF PREDICTED EFFECTS		TOTAL IGNORANCE INDEX	
Equation	Standardized Beta Coefficient	Change in R^2	Standardized Beta Coefficient	Change in R^2	Standardized Beta Coefficient	Change in R^2	Standardized Beta Coefficient	Change in R^2	Standardized Beta Coefficient	Change in R^2
Step 1		.11**		.06		.06		.06		.08*
Primary Anchor	-.12		-.06		.01		.04		-.02	
Other Anchor	-.20*		-.07		-.06		.06		-.06	
Meteorology Degree	-.16		-.19		-.22		-.09		-.22	
Journalism Degree	.03		-.12		-.17		.05		-.09	
Other science degree	-.13		-.16		-.10		.07		-.09	
Journalism and science degree	-.01		.00		-.07		.08		.00	
Market Size	.07		-.06		-.09		.03		-.04	
Step 2		.00		.00		.01		.03		.01
AMS seal	-.05		-.07		-.09		-.16		-.13	
NWA seal	.01		-.03		.02		-.10		-.04	
Step 3		.08*		.07*		.12***		.12***		.14***
Climate change is a serious issue	-.04		-.06		-.14		-.07		-.11	
Weathercast is the proper place to educate	-.10		-.06		-.02		.05		-.02	
Variations becoming increasingly common	-.07		-.09		-.23*		-.27**		-.24*	
Variations symptomatic of climate change	.03		.25*		.30**		.17		.28*	
Weather & climate are the same thing	.12		-.02		.11		.05		.08	
I understand the science of climate change	-.22**		-.18*		-.17*		-.26**		-.26*	
Total R-Squared		.20***		.13		.19**		.21***		.24***

* p < .05; ** p < .01; *** p < .001

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The Web and E-Mail in Science Communication: Results of In-Depth Interviews

A paper presented to the Science Communication Division,
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The Web and E-Mail in Science Communication: Results of In-Depth Interviews

Using open-ended interviews, researchers identified 12 themes concerning web and e-mail use by science writers. The web and e-mail "speeds information" between sources, reporters, editors, and audiences. "Skepticism" about information quality leads science writers to urge practices of "good judgment" by web users. A diagram illustrates ways "speeds information" is changing journalistic work. Suggestions concerning future research on diffusion of information are offered.

The Web and E-Mail in Science Communication: Results of In-Depth Interviews

Journalists work in a profession dependent upon accurate and timely information. In the past, gathering that information often meant poring through papers, visiting dozens of reliable experts, and telephoning sources in distant locations. Thanks to the Internet, all that has changed. Specifically, two features of the Internet- the World Wide Web and electronic mail (e-mail)- have helped bring about this change. Today journalists can search documents online and "chat" with experts without leaving the office. As for telephoning sources, many journalists now opt for e-mail.

Researchers are increasingly studying these new technologies. The Middleberg/Ross Survey of Media in the Wired World discovered that among print and broadcast journalists, e-mail now matches the telephone as a preferred method of communicating with sources (Middleberg/Ross 2000). Garrison (1995, 1997, 2000) has called computer-assisted reporting the dominant new newsgathering tool of the decade.

This article reports results of recent open-ended interviews with members of the National Association of Science Writers (NASW) seeking to understand more about how science journalists use e-mail and the Web in their work and how their lives are changing as a result of using these new technologies. Our interviews follow up an earlier two-part survey study of NASW members concerning how these journalists use e-mail and the Web to go about news making (Trumbo et al., 2001).

Science Journalism and the Internet

Even though today, the Web is a household word, the Web itself is a little more than a decade old. It began in 1989 as a collaborative project designed to make communication easier among scientific researchers around the world (Marlow 1996). E-mail also was used early and frequently in the scientific community to facilitate communication (Aborn 1988). This early use of the Web and e-mail among the scientific community makes the science "beat" an interesting one to explore.

Journalists who specialize in covering science have much in common with other journalists. For example, they must research and write their stories using the same guidelines and techniques that other journalists use. They must write clearly in jargon-free language that the average reader can understand. In addition, they must research very complex subjects on deadline, including conducting interviews with multiple scientific sources (Conrad 1999).

In today's fast-paced world in which science advances rapidly, the science journalist plays an important role. Stories written by these journalists serve as the primary way that most people learn about science (Nelkin 1995). Science journalism as we know it today has grown rapidly since World War II (Meadow 1986). As Rogers (2000) points out, one main reason for the growth in science reporting is that people are very interested in science. She cites the success of television programs like NOVA and the increasing popularity of science books directed to general audiences as support for this contention.

Use and Growth of E-Mail

The use of e-mail has been the subject of communication research for about two decades. Many studies focused on the technological efficiency of e-mail; many dealt with e-mail use within organizations (Rice, 1993; Steinfield, 1986; Schmitz and Fulk, 1991; Garton and Wellman, 1995, and Althaus, 1997). Researchers such as Kiesler, Siegal and McGuire (1984) looked at the social and psychological implications of communicating with e-mail versus more traditional methods of communication. They found that people using e-mail appeared to be less inhibited than those communicating face-to-face. Sproull and Kiesler (1991) concluded that e-mail not only affect how people work together, but can influence the structure of an organization. Phillips and Eisenberg (1993) point out that e-mail can be used to accomplish strategic goals within an organizational setting. Schaefermeyer and Sewell (1988) found that e-mail was replacing other forms of communication, including telephone, letters and face-to-face communication.

Today, e-mail use is pervasive, with users ranging from major corporations to academic institutions (Hunter and Allen 1992). Instructors use e-mail to enhance classroom instruction (Dorman 1998), health care researchers use e-mail to synthesize data (Bunting and Russell 1998) and petrochemical organizations use e-mail to do research (Schmitz and Fulk 1991). The Electronic Messaging Association, a group funded by corporate e-mail users, estimates that the largest 2,000 U.S. corporations have 5 million employees who share 6.1

billion e-mail messages each year (Ey 1995). Rogen International, which studied the effectiveness of e-mail and face-to-face communication in the workplace, found that e-mail use has grown by more than 600% in 6 years (Crowther and Goldhaber 2001).

Importantly, Dimmick, Kline and Stafford (200) discovered nearly half of their respondents reported using the telephone less frequently since they began using e-mail. Electronic mail was noted to be superior in fitting into people's work schedules and allowing them to communicate readily across different time zones. On the other hand, the phone provided greater sociability for respondents. These researchers concluded that telephone and e-mail both have broad niches which are not in direction competition with each other and aren't substitutes for one another. Flaherty, Pearce and Rubin (1998) drew similar conclusions in their study, pointing out that e-mail is "functionally specialized" serving as a unique communication channel that enhances but does not duplicate other communication methods.

E-mail and Science

E-mail was used early and frequently in the scientific community (Aborn 1988) and has been studied by Selnow (1988) Lievrow and Carley (1990) and Trumbo et al. (2001). As Lievrouw and Carley point out, NASA came up with the word "telescience" to describe how scientists living in different georgraphic areas used e-mail to communicate and collaborate. E-mail use is now widespread in American science (Walsh et al. 2000). E-mail also seems well suited for

journalists who rely on it to keep in touch with their offices and to communicate with sources thousands of miles away (Cochran 1997). In fact, 98% of journalists responding to the Seventh Annual Middleberg/Ross (2000) survey said they check their e-mail at least once a day and spend 15 hours a week reading and sending e-mail.

Use and Growth of the Web

Today nearly a half billion people worldwide have Internet home access (Nielsen/NetRatings 2002). In the United States, more than half of all households have a computer and over 80 percent of these households have access to the Internet (U.S. Department of Commerce Report, 2000). Vinton Cerf, known as the father of the Internet, estimates that about 75% of traffic on the Internet is on the World Wide Web, which is fast becoming one of the world's leading forms of communication (Cerf 2001).

Although the Web is only a little over a decade old, it has been the subject of much communication research. Johnson (1997) gathered detailed information about how public relations practitioners use the Web, particularly as a way to reach specific audiences, and Thomsen (1995) examined online tools for issues management. Others have concentrated on Web use within organizations (Esrock and Leichty 1998, Grupp and Margaritis 2000). The Web's use in health communication has been the subject of several researchers including Harris (1995), Chamberlain (1996), and Cassell, Jackson and Cheuvront (1998) and McMillan (1999). The Web as an advertising medium has also been examined,

with researchers discovering that Web advertisers need to do more to attract readers than advertisers in a traditional print medium (Sundar, Narayan, Obregon, and Uppal 1998).

The Web and Journalism

More relevant to this article is the use of the Web in journalism. Cochran (1997) points out that journalists are making the Web part of their daily routine and in so doing, are reshaping the profession. Garrison's most recent study (2000) examined journalists' use of the World Wide Web for newsgathering and discovered a significant growth in the use of the Web between 1996 and 1997. He discovered that journalists had few problems with the technology involved in online reporting, but that they did sometimes have trouble verifying facts and establishing source credibility on the Web.

Source credibility is a subject of much concern to journalists, who rely on experts, ranging from scientists to government officials, for nearly everything they write. Sundar and Nass (2001) suggest that with new online technology, manifestations of new technology such as a Webpage may now be considered "a source" by some users, creating confusion. As Weise (1997) points out, reporters who use the Web as a research tool may encounter rumors and lies presented as facts and truth. Journalists have an ethical obligation to ensure that what they report is accurate (Ketterer 1998). Yet, just about anyone with a computer can create a Webpage and post credible sounding information online. So, even as journalists enthusiastically embrace the Web as a research tool

(Middleberg/Ross 2000), many also complain about having to sift through useless information to find relevant and credible information (Houston 1999).

Still, most researchers agree that today's journalist must learn how to use these new online tools (Splichal 1993, Wendland 1996, Graves 2000). Davenport, Fico and Weinstock (1996) go so far as to predict that these new tools will require a different kind of reporter, one with a new mix of skills that rely less on observation and interviews and more on electronic information. The Web presents a challenge to newspapers, which according to Singer (2001) must reassess their roles as they move online. This new world of communication technology provides many challenges for mass communication researchers, who have a lot to learn about how journalists use the Internet (Stempel and Stewart 2000) Ultimately, the Web presents challenges to journalism educators, who must teach their students how to use these new tools and, importantly, how to evaluate online sources (Ketterer 1998). For all these reasons, the Internet provides many important opportunities for communication research.

Diffusion and Innovation

This article is limited to how the World Wide Web and e-mail are used by one specific group of journalists: science writers. As a theoretical framework for the study, we turn to the diffusion theory which describes how innovations spread throughout society. According to Rogers (1995), a quality of "innovativeness" is related to a person's willingness to try new products.

Therefore, the diffusion theory may be applied to the Internet, potentially yielding important information about early users.

Researchers have used diffusion theory to look at computers in general (Dutton, Rogers, and Jun, 1987); at gender differences in adoption behavior (Gegen and Straub 1997); and at news media consumption and technology adoption (Reagan 1989 and 1991). Having a favorable attitude about innovation and change and having some experience with computers can make a difference in adoption (Minsky and Marin 1999). The ease of learning and being able to show the benefits of using new systems may also lead to successful adoption of technology (Adams and Nelson 1992, Hunter and Allen 1991).

This article does not attempt to provide a complete discussion of diffusion theory which is discussed elsewhere. However, it is important to remember that in the diffusion process, Rogers identifies five categories of adapters. These are: Innovators—eager to try new ideas; Early Adapters—high degree of opinion and leadership; Early Majority—interact frequently with peers, but seldom hold leadership roles; Late Majority—skeptical and often adapt out of economic necessity; and Laggards—traditionals for whom the point of reference is the past.

In a study linking diffusion theory to Internet use, Howard, Rainie and Jones (2001) found that an Internet users' willingness to be innovative, as defined by Rogers, was more important than demographics in predicting people's feelings about and use of the Net. These researchers identified four categories of Internet users: Netizens—innovative and aggressive users, who have incorporated the Internet into their work and home lives; Utilitarians—use Internet

as a tool and log on from home everyday, but less intent in use; Experimenters—use Internet to retrieve information; and Newcomers—are still learning their way around the Internet.

Trumbo et al. (2001) recently used the diffusion framework to analyze the spread of Internet use among science writers. In their two-part study, these researchers found that the diffusion-based concept of favorableness predicted an enthusiasm for the Web among the journalists surveyed.

Study Design and Research Questions

This research project extends the work by Trumbo et al (2001) which determined that the Web and e-mail use by members of the National Association of Science Writers (NASW) is firmly established. These researchers also speculated that because of the technologically advanced nature of the science beat, science journalists may be ahead of typical journalists when it comes to using the Internet.

We wanted to investigate the processes and meanings involved in Web and e-mail use more than was possible through the quantitatively-oriented surveys of the earlier study, so we elected to complete a series of in-depth interviews with a subset of the NASW survey participants. To guide our interview project, we set three goals: The first was to gather rich descriptions from these science journalists so we might identify and detail thematic ways e-mail and the Web are changing science journalism. The second was to develop a diagram to help explain the most noteworthy changes related to the use of e-mail and the

Web in the work of the science writers we contacted. The third was to consider how all this information might enlighten our understanding of diffusion theory.

Drawing on those goals, our literature review and earlier findings, we posed the following research questions about e-mail:

Research Question 1: How are science journalists using e-mail in their work?

Research Question 2: How has e-mail changed the work process for science journalists?

Research Question 3: How do science journalists feel about e-mail's influence on their field of work generally and on their own work specifically?

We also posed the following questions about the Web:

Research Question 4: How are science journalists using the Web in their work?

Research Question 5: How has the Web changed work for science journalists?

Research Question 7: How do science journalists feel about the Web's influence on their field of work generally and on their own work specifically?

Research Question 8: Do science journalists express concern about the quality of Web-based information?

Finally, we posed the following questions about these new technologies:

Research Question 9: What consistent patterns between themes do the journalists express related to the use of e-mail and the Web?

Research Question 10: Do these interviews inform our understanding of diffusion of information via e-mail and the Web in any way(s)?

Method

To answer these questions, we conducted a series of open-ended phone interviews using a semi-structured "interview guide approach" similar to that discussed by Patton (1990). That is, topics and issues were specified in advance, but each interviewer was free to determine the sequence and wording of questions during the interview.

A total of thirty-six survey respondents had previously indicated that they would be willing to be interviewed. So, we contacted each potential interviewee by e-mail to determine whether he/she was still interested in participating in a phone interview and to establish a specific time for the phone call. We interviewed twenty one individuals from that pool of respondents (See below).

The science writers we contacted worked for a variety of science information outlets including newspapers, magazines, television, radio and the web. Moreover, they represented a cross-section of the kinds of careers related to science journalism. Eleven identified themselves as freelancers; two identified themselves as editors; the rest identified themselves as writers or reporters. While a few of the writers covered medicine or health exclusively, most covered a broad range of scientific topics. All of those we interviewed had covered science for at least five years, with about half working in this specialty area for ten years or more.

Each phone interview lasted 20-30 minutes and was tape recorded after receiving verbal permission from the respondent. All completed interviews were transcribed, save one which was inaudible. We conducted an additional interview

to replace that one and bring our sample up to twenty. (A listing of the interview questions can be found in Appendix A.)

Following Boyantis (1998), we decided to use each interview as a unit of analysis and to look at the response to each question as the unit of coding. We wanted to inductively identify themes or recurring ideas to use for a later content analysis across all interviews. Thus, we used a data-driven approach to coding which followed five steps: a) reducing the raw information, b) identifying themes within subsamples, c) comparing themes across subsamples, d) creating a code, and e) determining the reliability of the code.

A theme was defined operationally as specific key words or implied ideas in order to identify "a pattern found in the information that- at a minimum describes and organizes the possible observations and - at maximum interprets aspects of the phenomenum being studied" (p.4.) Potential themes were identified using the written transcriptions by two trained coders working independently. One interviewer found 15 themes present in the interviews while the other interviewer found only 12. Since the same 12 themes had been identified by both coders, the decision was made to use them to establish a preliminary codebook.

Because we wanted to ensure high quality codes, the code developer specified five things for each theme: 1) a label or name, 2) a definition of what the theme concerns (i.e. the characteristics or issues constituting the theme) 3) a description of how to know when the theme occurs (i.e. indicators to "flag" the

theme) 4) exclusions or special conditions, and 5) examples, positive and negative, to eliminate confusion when coding. (See Boyatzis 1998, pg. 53).

Once the codebook was developed, the codes were applied to a subset of six interviews by two different coders. Inter-coder reliability was calculated using this formula for co-efficient of reliability:

$$C.R. = \frac{2M}{N_1 + N_2}$$

where C.R. = coefficient of reliability, M= Number of Coding Decisions agreed upon and N= Total Number of Coding Decisions Made by Each Coder (Poindexter and McCombs, 2000).

Our initial coefficients of reliability (or what Boyantis, 1998, calls percentage agreement on presence) were as follows: *Facilitates communication* (100 percent agreement); *E-Mail Interviews*, (83 percent agreement); *Spans geographical boundaries and time zones*, (100 percent agreement); *Research tool* (100 percent agreement) ; *Skepticism*, (83 percent agreement); *Changes personal contact*, (66 percent agreement) ; *Speeds information*, (83 percent agreement); *Increases productivity*, (83 percent agreement); Reduces paper, (83 percent agreement) ; *Enthusiasm for Web and Email*, (83 percent agreement); *Work Hours expand*, (100 percent agreement); *Good judgment*, (83 percent agreement).

To raise the reliability for the *Changes personal contact* theme, we reviewed all coding decisions and modified the codebook description to avoid future discrepancies. The revised description was applied to six additional interviews independently by both coders resulting in 100 percent agreement. We

incorporated all the reliable descriptions into the final codebook to use for our analysis.

Detailed notes were kept by the primary researcher about what key words or ideas accompanied the expression of each theme when the analysis was being conducted. These notes were later used to identify patterns in themes across interviews or to locate differences between the ways interviewees talked about a particular theme.

Notes were also kept about potential relationships between themes for later exploration using all the interviews. Morse (1994) calls this process "synthesizing" to describe the development of a composite or typical pattern of behavior, while still identifying variations in the data. Both primary researchers completed this portion of the analysis process. Together they developed and confirmed elements which would eventually become the diagrams shown in the results section. Finally, we asked questions and looked for answers to try to link our data to diffusion theory.

Results

The science writers we spoke with recognized the potential inherent in e-mail and the Web to transform the practices of sharing scientific information as well as in changing their daily work practices. They spoke both of changes which had already occurred as well as anticipated changes as the new technologies become refined and as they find ways to use them more effectively. Twelve different themes concerning the use of e-mail and the Web were uncovered in

our interviews. These themes are marked in italics throughout the results section of this paper and are explained further in Appendix B[i] All the writers we interviewed agreed that e-mail, in particular, has changed the way journalists work by *facilitating communication* with sources, with other journalists, and with the audiences or readers they seek to inform. Repeatedly our respondents used words like "efficiency" and "easier" to describe their experiences to incorporate e-mail in their daily work.

For instance, using e-mail means that journalists can contact sources readily. One writer stated simply, "E-mail is a tool of convenience." (Interview 4). This convenience is particularly important in contacting the busy scientists and medical professionals that serve as primary sources for rapidly changing scientific information. One of the science writers said,

> It's simply easier to contact people and to ask them specific questions... it makes it convenient when people are busy... and reporters and scientists are. It makes it convenient in a way (the) telephone never was... It makes me a lot more efficient in terms of aiming what I'm doing, in putting my efforts in the right place, not wasting time. (Interview 2).

Another remarked,

> It (e-mail) has become kind of indispensable as a system of keeping in touch with people. You can keep in touch with more people. You can communicate better. (Interview 3).

Similarly another respondent pointed out that e-mail was the "main mode of communication with my clients." (Interview 14).

Several interviewees pointed out that previously reluctant sources respond more readily using e-mail. Thus, they could get sources via e-mail that they wouldn't get otherwise.

> A lot of people who won't pick up their phone will respond to e-mail because they're on their computers a lot, or they just don't like talking on the phone. A lot of times what I'll do is I'll send an e-mail to researchers saying, 'Saw your paper, I'm interested in writing about it. Is there a time we can set up to talk?' ... It leaves it up to them and their discretion when they can respond. (Interview 12).

E-mail serves as a source of information in other ways as well.

Most of our interviewees mentioned using e-mail information that comes to them through listservs or other means to gather important scientific information.

> I tend to use e-mail, not to receive press releases, but to receive what I call filtered information. That is, particular sources that sift through research information and prepare digests, and I think many, most of the ideas we get now for articles come from these sort of e-mail digests that we've subscribed to. (Interview 10).

Others do more *enthusiastically* receive press releases, especially from respected sources they have learned to trust.

> I'm on listservs and automatic press release alerts... I get his little digest of leads three or four times a week, and I get them from Johns Hopkins University... the best in the country... I mean, (these sources) are amazing at getting coverage of their stuff, simply because they have such a great e-mail alert system. (Interview 8).

Respondents also commented consistently that e-mail is helpful in clarifying information or doing follow-up questioning.

> It (e-mail) facilitates review of the more technical articles also because now I can write it, send it to my researchers to look through, do a fast check if you will, and they can have it back to me in a couple of days. The mail would have taken longer than that. (Interview 5).

Similarly, one science editor remarked,

> You can kick back pieces of text with comments, and then comments on the comments and so forth, so easy to forward, cut and paste, show it to everyone, send copies around, have it checked a lot of ways. (Interview 10).

E-mail also helps contact new or difficult to reach sources in distant locations helping to *span boundaries* that existed when using previous means of connecting.

> At the moment, I'm sitting in a cabin in the Sierra foothills. And this morning already, I've communicated with a doctor in Chicago for the Arthritis Foundation, with an ALS specialist in London... With an editor at Planet RX in San Franscisco... with my website technician who's in Canada... with a former reporter and her Neimann Fellowship at Harvard... And that's just this morning. (Interview 1)

Several mentioned not only the ease in contacting distant sources, but pointed out that email helps in interpreting when languages are different.

> I think it also smoothes out the language difficulty. Sometimes it's just easier to read English or read French or whatever the language may be, rather than to have to decipher it on the fly. (Interview 5).

Time is also a previous barrier that is now alleviated through e-mail communication. For example, another science writer said that with email,

> You're not limited by the time available. It used to be that you could only communicate with people, you know, basically during working hours... But you can send an e-mail in the middle of the night and get your answer in the morning. It has expanded the time available to communicate. (Interview 3).

The science writers we spoke with differed in whether or not they chose to do completely *e-mail interviews*. Some seemed to prefer this means for their interviews:

> In about, say, 24 (to) 48 hours, I had managed to talk to people in Israel, Japan, Switzerland, England, all around the world. And it was just remarkable to me that I was able to reach these (busy) people to get the information I needed, and to be able to do it so rapidly, and not to be chasing after them by telephone, which would have been my practice before. It was a real timesaver for me. (Interview 9).

Other respondents still rely on traditional means of *personal contact* with sources:

> I still need to have a voice unless I'm very close to a source. I still need personal contact from time to time. There may be times when you're tempted to cut a corner because of time pressure- and you need to be very careful how you do that but, it simply is a timesaver and you need to use good judgment in deciding when an e-mail interview is as good as a voice interview... Voice is still the ultimate. (Interview 6).

Overall, our respondents seemed to agree that e-mail is *facilitating communication* and most regarded the way it is changing their work positively, though some problems with e-mail communication in widely distributing inaccurate information were noted. Overall the respondents we talked to seemed to agree with the idea expressed by one: The thing that is really changing the practice of journalism is e-mail... E-mail has changed the nature of communication. (Interview 2).

However, few would argue that the Web has also caused pronounced changes in reporting scientific information, though most of our sources showed more *skepticism* about using information from the Web.

> The trouble with the Web is that you have to consider the source. Yeah, if you're going to the Washington Post or the New York Times, you're going to get a good level of trust. But there's a lot of garbage out there. A lot of garbage, and a lot of it is very hard to see whether or not it's commercial... Even the American Cancer Society has an axe to grind, has an agenda, has a bias. It may be a perfectly good bias, but it's there. They've got their own little mindset. Anybody can put up a Website about a disease and sometimes these are very very helpful, but sometimes they're not... There's a lot of rumor... there's a lot of plain garbage. (Interview 7).

> I don't like chatlines; I don't do that stuff. It would be like using as sources from the people in the corner McDonalds. There's no way I'm going to be able to trust anything like that. (Interview 8).

Still others said that they were *not more skeptical* of web information than for information from other, more traditional, journalistic sources.

> I'll treat it (a news release or a statement released by the government over the Web) the same way I treat paper coming through the mail that was issued by a government agency, a university, a company...an environmental group or some other interest group. It goes through the same filter. There is obviously a lot of junk out there... I don't use risky stuff at all. (Interview 6).

The bottom line for our interviewees is that journalists and others using the Web (such as consumers of health information) must exert *good judgment* about evaluating the credibility of sources and determining the motive and bias that a Website creator has regarding the topic they've presented.

Even though the science writers expressed *skepticism* about Web-based information, every single respondent spoke of using the web as a *research tool*, one they used to seek a wide variety of information. For instance, science writers frequently look to the web for background information, for keeping in touch with colleagues, for finding potential sources, as well as for identifying more specialized sources.

> I think that it's made it a lot easier for me as a journalist to find certain types of information, to track people down, to get information from databases, to get in touch with scientists, to find scientists who might be working on obscure studies or studies that haven't been published yet, um, to access libraries that aren't where I am. (Interview 13).

> Basically, I use the web as a way of keeping up with associates in the work and as a way of doing my own fact checking. If I need someone's full title or phone number I can usually find it somewhere on the web... Those are the main uses. (Interview 14).

Some science writers have learned to use the Web to get access to new kinds of Information and thus, for exploring new story ideas.

> I use the Web mostly for getting story ideas that I wouldn't be able to get unless I were on the phone, all the time, all over the country. Being in (a large but remote city), trying to cover national stories, it is sometimes difficult to really get plugged into what's happening at MIT or Stanford or some centers where some really cutting-edge science is going on. I use the Web a lot to look at other universities to see (what is going on.) (Interview 12).

So the Web is increasing story ideas and access to stories from new locales for some journalists

Other writers have come to use the Web to find published research articles.

> I do a lot of medical writing. I was just overjoyed when the National Institute for Health made Medline freely available to people. It used to be something you had to subscribe to... Well, now I can at least do the Medline searching at home, pull it all up, print out what I want or cite the articles, read the abstracts, figure out which ones I really need (and go get them)... But with this next level that's coming it's going to be that much easier, cause I am going to be able to get into real full-text articles, research articles that I want to read, and they're going to have it set up so that if you're reading one, and it has a footnote that you're interested in, you can click on the footnote and it'll take you to that next article. (Interview 8).

Science writers also find the Web a useful source for information about cutting edge research or breaking news. Here's a detailed example:

> I was just finishing up a section of my book having to do with testing for

> Cervical cancer. And a new test for human papilloma virus was just approved by the FDA, and so there was a barrage of information on the Web, and some of it was from the company that manufactures this test. Well, we're used to that sort of thing, but I also had the advantage of seeing comments by various physicians on this test, medical journal articles citing it and showing an evaluation of it in different circumstances, and I had because of the news release (online), the name of the scientist who actually was the medical director at the company that manufactures it, and with that information I called him and interviewed him, and got quite a lot of information from him very fast, that I was then able to verify with other people, and so altogether, I think it really improved the depth and the accuracy of my report. (Inteview 9)

The latest Web-based technology can be used for transferring information other than pure text and these capabilies are also being used by some but not all of the science writers we talked to. One editor reported,

> We're an illustrated magazine and we spend a lot of time looking at visual material on the Web , for photos and illustration, and we acquire most of the raw material for illustration digitally now, sort of suck it off the Web. Not that we publish that, but you get, you know, you find out what pictures people have of different things, and then you contact them. But almost everybody's got some kind of sample of what they have on the Web now. (Interview 10).

Another writer pointed out,

> I have a few sources I routinely check. And then I end up getting on the phone, calling to see if they have diagrams or photos to go with it. Some of the better sites will have those on-line. So you can make contact with your expert, go to the site, download the photo, and have a complete package to send to the editor. And I'm seeing that more and more- as the editors want their writers to provide the photos as well. I think that's because they're generally available on the internet. Not necessarily in the right format. But they are available. (Interview 5).

Science writers clearly use the Web to gather information as they go about their work in a variety of ways and for a variety of purposes, often they noted, removing tedious aspects they experienced before this new technology was available to them.

An important function for both e-mail and the Web in the area of science communication is to *span boundaries across time and space* for science writers. For many, this means new kinds of story ideas or new ways of more readily working with distant sources.

> I can do a quick Web search, a lot of times I can find somebody who's doing up-to-date work on subjects as diverse as hearing in crickets to... oh, freeze tolerance in woolly bear caterpillars. So I can use the Web, and I can talk about local insects, and introduce people to notions that they wouldn't ever be introduced to if I just relied on local resources. So, I do that every week. (Interview 15).

Together e-mail and the Web are changing the ways journalists work. All but two of our interviewees pointed out that e-mail and the Web *speeds information* in their worklife. In fact, this theme stood out most in both individual interviews as well as across all interviews, as being a prime reason for the consistent expressions of *enthusiasm* about these new technologies.

> I find a lot of times that people will respond to e-mail quickly, where a phone call might take a couple of days to return. But if they're in the office they usually respond, and I can get an interview set up pretty quick. As far as using the Web for work, let's see... well I do all the time. (Interview 15)

Or consider this:

> One of the amazing emergent properties of the Web is that when you use certain key words and permutations and actually using language that I would only know as a specialist... You can zero in on a large proportion of members of a relative, increably specialized community, pretty quickly. (Interview 4).

Some of the respondents mentioned ways the Web and e-mail *speeds information* in their work with *less enthusiasm,* stating that the new technologies were making their work more competitive, more demanding or *increasing work*

hours. Interestingly, some of the same respondents listed positive and negative effects from quickly *speeding information.*

> There are a lot of magazines, particularly the cutting edge magazines, things like Popular Science, for example, if the information is more than a day or two old, it doesn't go in. Even though they're a print magazine , you have to be fast now. (Interview 5).

Or this one:

> It (the Web) also puts more stress on journalists. It used to be when you were doing print journalist you maybe had a couple of editions to update. Now on the internet, you will be updating constantly. It also, I think, tends to encourage revision, which can be a good thing, but also you can revise too much. (Interview 1)

Later in the interview, this same repondent stated,

> It (the Web) tends to fuel my workaholic... I have two computers on at the moment. My laptop that I brought with me and also the computer that my host has here. So, because of time, for example, I've checked the sales ranking on my book on Amazon this morning... I wouldn't be able to do that ordinarily. So it just keeps me much more in contact with my work. (Interview 1).

Because both positive and negative work results were linked to the *speeds information* quality of e-mail and the Web and because this particular theme was mentioned so often and with such emphasis by the respondents, we looked across all the interviews to see how different ideas were linked to *speeds information.* The resulting links between themes in our interview data are shown in Diagram 1. On the positive side, as the Web and e-mail *speeds information,* journalists are able to complete somewhat tedious tasks more easily-such as fact checking and playing phone tag with sources. Thus, in these ways the *speeding of information* can *increase productivity.* On the negative side, though, journalists

must respond to a quicker news cycle, quicker deadlines, more competitiveness in their work so it's possible for their *work hours to expand* and for them as well as to create other job-related stresses related to time management.

Conclusions

E-mail and the Web are having a tremendous impact on the practices of science journalism and on the lives of science writers according to our study. Importantly, our sources told us that although these technologies *speed information* in ways that benefit their work and the dissemination of information, not all the effects are positive. This discovery about how *speeding information* works in different ways is, we believe, the greatest contribution of our research project..

More research is needed to verify our projections about the processes underlying *speeding information* with other science communicators and with other groups. Developing such a detailed base of information could supplement and expand the existing literature about the diffusion of innovations in important new ways- perhaps even foreshadowing some coming trends as e-mail and Web use continue to expand.

Our interview work also supports the content by Trumbo et al. (2001) that trust is linked to enthusiasm, particularly when it comes to the Web. Our respondents appeared cautious, but generally enthusiastic about many of the changes brought about by e-mail and the Web. Enthusiasm was less likely when respondents heard about or experienced the rapid spread of misinformation or

rumor. Thus, they spoke about the need for using the new tools with caution and urged future journalismstudents to learn about and practice using the new tools and developing *good judgment*. Additional research is needed in this area so that the highest quality of accurate information is reported to the public..

We also found some evidence, albeit limited, in our interviews for Netizens, Utilitarians and Experiments using the categories developed by Howard, Raime and Jones. That is, our Internet users tended to show enthusiasm and loyalty to using the Web and e-mail in new ways. They have all moved beyond the Newcomer stage of diffusion. Further exploration of those categories could yield additional details about how diffusion processes work in spreading scientific information via e-mail and the Web. Moreover, research could begin to tell us about the processes underlying the diffusion of scientific breakthroughs and other important scientific information amongst the general public. Such research is vitally important in the times ahead.

In this project, we found that our interviews answered, to some extent, all the research questions posed. E-mail and the Web <u>are</u> changing the nature of science communication in significant and potentially far-reaching ways. We fully expect that these new technologies and the ways journalists use will continue to dramatically change what we learn and how we learn about science in the future.

[i] We chose quotes to include in the article that reflected ideas expressed similarly in several interviews. In other words, care was taken when writing NOT to use anomalies or exceptions in our writeup. Where a quoted example was less frequently expressed or where it represented an unusual example in our sample, the text introducing the theme notes this.

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Diagram 1: Speeds Information Relates to Increased Productivity

The Positives:

1) Faster responses to questions and quicker fact checking leads to quicker turn around time when writing a story.

2) Time freed from tedious tasks (fact checking or looking for details in print) can be spent developing new stories.

3) Information coming more quickly from distant sources means possibilities are increased for international stories or for developing new angles for local science stories.

4) Getting information and visuals quickly can help meet and beat deadlines.

5) Breaking science news can be accessed readily via the Web and maybe e-mal.

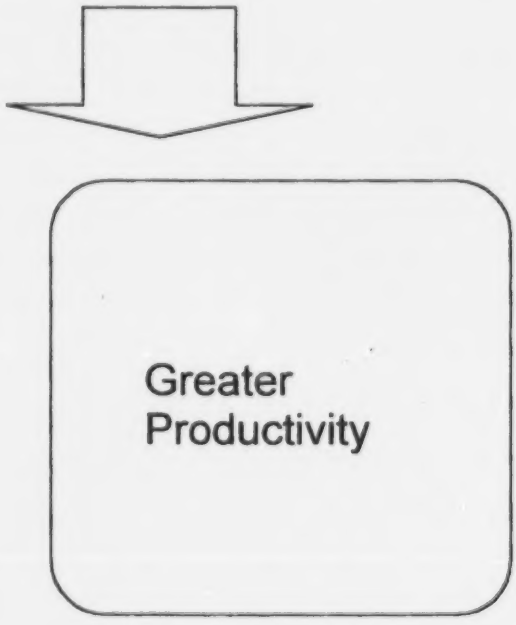

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Diagram 2: Speeds Information Relates to Work Stress

The Negatives:

1) More competition on stories means the writer needs to stay ahead to get the scoop.

2) Less time to reflect on the meaning of stories is available to draw carefully conceived interpretations.

3) Too many choices to make about possible stories can be overwhelming.

4) Increased likelihood of incomplete incomplete, false of misleading stories or story ideas (that may be widely distributed about believed by consumers).

5) More hours on the job may be needed to keep up with breaking science news posted via the web or e-mail.

Increased
Work Stress

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Book Reviewers' Recognition of Environmental Ethics In Aldo Leopold's *A Sand County Almanac*

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Abstract

Aldo Leopold, who wrote his seminal work, *A Sand County Almanac* in 1949, is now credited with formulating and articulating some of the basic ethical and philosophical tenets that lead to the development of biology conservation, land ethics, biocentrism, deep ecology, and biodiversity. Analysis of the initial treatment and reception of the book by reviewers shows that only one reviewer, Hal Borland, recognized and emphasized the important ethical questions and concerns that Leopold raised regarding man's relationship to nature.

Book Reviewers' Recognition of Environmental Ethics In Aldo Leopold's *A Sand County Almanac*

Introduction

A Sand County Almanac by Aldo Leopold, published in 1949, has become recognized as one of the earliest and principal works of the modern environmental movement.[1] Leopold is credited with formulating and articulating some of the basic ethical and philosophical tenets that lead to the development of biology conservation, land ethics, biocentrism, deep ecology, and biodiversity.

Leopold died a week after *A Sand County Almanac* was accepted for publication, and although other works have been collected and published posthumously, it remains his seminal work. Although Leopold is now considered a prophet and the book is revered among environmentalists, *A Sand County Almanac* never achieved the initial public notoriety associated with Rachel Carson's *A Silent Spring*.[2]

Perhaps this is because Carson's book dealt with what would become known as the first modern, science-caused environmental crisis: the debilitating

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[1]Aldo Leopold, *A Sand County Almanac* (Oxford University Press, 1949).

[2]Rachel Carson, *A Silent Spring* (Boston: Houghton Mifflin Co., 1962).

effects of the chemical DDT on the life cycle of birds, and the public understood the direct cause-and-effect relationship and the resulting harm. But Leopold's book had nothing catchy about it. It was presented as a "nature book," a journal of musings about nature by a man who had worked his whole life as a forester, ranger, and conservationist.

It was not until the environment became a national issue is the late 1960s and early 1970s that *A Sand County Almanac* began to receive recognition that had been previously reserved to a small core of literary naturalists and conservationists (before "environmentalists" were part of the scene). As public and political interest in the environment grew, including increasing numbers of members in activist and advocacy groups, the discipline of the environment also grew and expanded. And like any new and changing social, political, or academic movement, it started researching its history and roots.

And while there are several familiar and traditional American names associated with "nature" and the "wilderness," such as Thoreau, Audubon, Muir, Roosevelt, and Carson, it is Leopold who now receives credit for developing the foundation upon which much of the underpinnings of modern environmentalism rest.

The purpose of this paper is to trace the recognition of the importance of *A Sand County Almanac* by examining the function of book reviews in the press. By analyzing the content of the book reviews, the prominence of the reviewers and the types of publications they appeared in, this study will endeavor to trace the

initial treatment and reception of the book by reviewers, and possibly the path of the book as it grew in stature and recognition. This recognition is correlated to the growth of several parallel and related movements: that of conservation into environmentalism, nature writing into environmental literature, the development of the field of environmental ethics, which includes such concepts as biocentrism, deep ecology and biodiversity. However, it is beyond the scope of this paper to examine the book's influence on these and other related areas, such as the political, legal and educational changes that have resulted from the development of these new areas of study.

Book reviews play an important role in the process of book publishing. The modern book review has evolved from the discipline of literary criticism, which originated in the eighteenth century as technology enabled the large-scale production of books.[3]

Because of space limitations in modern newspapers, the critical essay was shortened into a "review," which served the purpose of introducing the book to the public and also giving an evaluation of the importance of the work. This form was fully developed during the 1930s and '40s, when works by authors such as Hemingway, Lewis, Steinbeck and Sandburg were widely discussed.[4]

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[3]Evelyn Oppenheimer, *Oral Book Reviewing to Stimulate Reading: A Practical Guide in Technique for Lecture and Broadcast* (Meutchen, N.J.: Scarecrow Press, 1980) ,1.

[4]Oppenheimer, 2.

Important factors of a review include the publication it appeared in and how prominently it was placed, if the reviewer was a well-known author or critic, and of course, the opinion expressed by the reviewer.

The academic disciplines of literary criticism and literary history have developed many diverse concepts and theories in the last half of the twentieth century, such as poststructuralism and deconstruction, but these ideas are usually restricted to academia and are not addressed in most reviews that are targeted to the general reading public.[5] As one scholar says in discussing literary criticism:

> English and American critics often assume that literary theory is the servant to a servant: its purpose is to assist the critic, whose task is to serve literature by elucidating its masterpieces. The test of critical writing is its success in enhancing our appreciation of literary works, and the test of theoretical discussion is its success in providing instruments to help the critic provide better interpretations.[6]

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[5]David H. Hirsch, *The Deconstruction of Literature: Criticism after Auschwitz* (Hanover: Brown University Press, 1991), 5. Reader response and intentionalists debate: "Did meaning, if indeed there was such a thing at all, reside in the mind of the author, in the text, or in the perceiving mind?"

Thomas Eagleton, *Criticism and Ideology: A Study in Marxist Literary Theory* (London: Verso, 1998, First edition, NLM 1976). 44. Eagleton established the following categories for a materialist criticism: General Mode of Production, Literary Mode of Production, General Ideology, Authorial Ideology, Aesthetic Ideology, and Text.

For a discussion of literary criticism and history, see: Ralph Cohen, ed. *New Directions in Literary History* (Baltimore: Johns Hopkins University Press, 1974).

Jonathan Culler, *On Deconstruction: Theory and Criticism after Structuralism* (Ithaca, N.Y. : Cornell University Press, 1982) , 17. Culler identifies the following types of criticism: structuralism, reader-response, deconstruction, Marxist, pluralism, feminism, semiotics, psychoanalytic, hermeneutics, antithetical, etc.

[6]Jonathan Culler, *On Deconstruction: Theory and Criticism after Structuralism* (Ithaca, N.Y. : Cornell University Press, 1982) , 7.

The Writing Career of Aldo Leopold

At the time of his death in 1949 at the age of 61, Aldo Leopold was not known as a nature writer. He had written extensively over the course of his life, producing over one thousand essays, articles, reviews, handbooks, newsletters, reports and position papers.[7] These writings were the product of a lifetime spent working with the outdoors, as forester and ranger, and later as a professor of agricultural economics at the University of Wisconsin.[8]

These types of writings were aimed at his peers and fellow conservation workers and researchers. A brief example of some titles show that these works were hardly the type of writing that would be known outside of its field: *Wild Game as a Farm Crop* (1930), *Game Methods: The American Way* (1931), *Report of a Game Survey of the North Central States* (1931).[9]

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[7]Peter A. Fritzell, Aldo Leopold, In: *Nature Writing,* ed. John Elder (New York. Scribners, 1996) 525-547.

[8]Curt Meine, *Aldo Leopold, His Life and Work* (Madison: University of Wisconsin Press, 1988).

[9]Curt Meine and Richard L. Knight, eds, *The Essential Aldo Leopold. Quotations and Commentaries,* (Madison, University of Wisconsin Press, 1999).

Indeed, if it had not been for the writing of *A Sand County Almanac*, Leopold would still have an important place in the history of conservation, as he was extremely well known and recognized within the field of biology conservation and has been called the "father of the profession of wildlife management in America."[10] Leopold wrote a textbook, *Game Management*, which was published in 1933 and was still in use in 1967 in many universities that taught wildlife biology and management.[11]

Leopold was educated at Yale and received his Master of Forestry degree in 1909. He was to spend the next 35 years working and teaching in the developing field of game and wildlife and natural resource management, which all fell under the umbrella of "conservation." It was during the mid 1940s, when he was working as a member of the Wisconsin Conservation Commission and trying to develop a campaign to convince the citizens of Wisconsin that the deer population needed to be reduced, that he started trying to develop his ideas for a new conservation ethic.[12]

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[10]Susan L. Flader, *Thinking Like a Mountain: Aldo Leopold and the Evolution of an Ecological Attitude Toward Deer, Wolves, and Forests* (Columbia, University of Missouri Press, 1974).

[11]Raymond F. Dasmann, "A Sand County Almanac. With Other Essays on Conservation from Round River. A Review" *Quarterly Review of Biology,* 42(3) (September 1967) , 417.

[12]Flader, *Thinking Like a Mountain*

Drawing upon and revising ideas that he had espoused in two earlier essays: *Conservation Ethic* and *Biotic View of the Land*, and adding his views about stewardship and responsibility, Leopold produced what is considered his seminal essay, *The Land Ethic,* which was published in *A Sand County Almanac.*[13] The earlier essay, *Biotic View of the Land*, has also become recognized as the first articulation of the concepts that developed into the field of ecology, and later, into what is now becoming recognized as one of, if not the most important tenet of environmentalism, that of biodiversity.[14]

Leopold was unique in that not only did he help redefine the "practical" side of early conservation by developing the field of fish and wildlife and forest management, but he developed philosophically along the way. He went from the traditional view that man is in charge of natural resources to use as seen fit, to the development of an "ecological conscience." He wrote that "we are only fellow-voyagers with other creatures in the odyssey of evolution" and that an ecological conscience requires that "'Homo sapiens (change) from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow members, and also respect for the community as such.'"[15]

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[13]Aldo Leopold, *A Sand County Almanac*

[14]Susan L. Flader, *Thinking Like a Mountain*

[15]Bill Deval, George Sessions, *Deep Ecology: Living as if Nature Mattered* (Layton, Utah: Gibbs Smith, Publisher 1985), 85.

This philosophy was later refined and expressed: "A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise." This is perhaps one of his most famous quotations from *A Land Ethic* essay. Leopold learned extensively from his experience in game management, which showed him that a species could not be treated separately from its habitat and that if humans were in control of the habitat, this meant that destruction of the game's habitat also threatened human habitat. As he said:

> Just what and whom do we love? Certainly not the soil, which we are sending helter-skelter downriver. Certainly not the waters, which we assume have no function except to turn turbines, float barges, and carry off sewage. Certainly not the plants, of which we exterminate whole communities without batting an eye. Certainly not the animals, of which we have already extirpated many of the largest and most beautiful species.[16]

By 1987, one hundred years after Leopold's birth, this philosophy had been embraced by a wide audience, as *A Sand County Almanac* has sold over a million copies through five editions and forty printings.[17] As one scholar noted:

> In fact, few works of American literature of any kind have had the practical and programmatic impact of *Sand County*. It has become the essential scripture of the so-called environmental movement, and of so-called environmental education. It has been primarily responsible for the development of the professional subfield in philosophy, "environmental ethics. ... It has been adopted as a text in countless university and college courses, and parts of it have been anthologized in still other textbooks and readers.[18]

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[16]Philip Shabecoff, *A Fierce Green Fire: The American Environmental Movement* (New York, Hill and Wang,1993).

[17]Peter A. Fritzell, Aldo Leopold. In: John Elder, ed., *Nature Writing*, (New York: Scribners, 1996), 525-547.

[18]Fritzell, *Aldo Leopold*, 526.

Book Reviews Upon Publication

There is little doubt that *A Sand County Almanac* is one of the most important environmental books ever written and that it has had tremendous impact on the field. The purpose of this paper is to review the degree of significance the role of the press had, specifically through initial book reviews, in recognizing the importance of this work and its potential for the development of modern environmental philosophy. A chronological analysis of book reviews will examine (1) the role that initial book reviews played in the immediate years following the book's publication, (2) if later book reviews recognized the book's growing influence in the 1960s and 1970s with initial growth of the environmental movement, and (3) if reviews recognized the book's potential importance in the development of the later concepts of environmental ethics, biodiversity, and deep ecology in the 1990s.

A Sand County Almanac is organized into three parts: Part I, titled "A Sand County Almanac," is a compilation of chronological essays describing a year on Leopold's Wisconsin farm; Part 2, "Sketches Here and There," contains essays on nature based on his work and travel to a variety of sites including Illinois, Iowa, Arizona, New Mexico, Oregon, Utah, Chihuahua and Sonora, Mexica, and Manitoba, Canada. Part 3, "The Upshot," contains the following four essays: *Conservation Esthetic*, *Wildlife in American Culture*, *Wilderness*, and *The Land Ethic*.

In an October 1, 1949 one-paragraph review in *Kirkus Reviews* the essays are called "slight and charming enough" but the reviewer notes that they "would have a very limited appeal to those who enjoy random bits of nature."[19] The reviewer also reports that Leopold "pulls no punches" with his criticism on the "degeneration of sports" or his opinion "that most conservation is local alleviation" or that "land health is better than land doctoring."[20] But ironically, the reviewer concludes that the "flavor of his writing" along with the sketches ultimately "do not give one a sense of actually challenging the reader."[21]

The exact opposite response is given by Alan Devoe in a review in the October 28, 1949 issue of *The Commonweal*.[22] Devoe noted that Leopold was "an exceptionally sensitive and subtle appreciator and communicator of earth-values."[23] The term "earth-values" may have coined by Devoe, and it certainly reflects the values that have become synonymous with environmentalism. Devoe describes the prose as "at once delicate and strong" and "it abounds in terse epigrammatic observations."[24] He then cites several of these epigrams, starting with one from the essay *The Land Ethic* that has become one of the touchstones of environmental philosophy – "A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise."[25]

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[19] *Virgnia Kirkus' Bookshop Service* 17, no. 567, (October 1,1949).
[20] *Ibid.*
[21] *Ibid.*
[22] Alan Devoe, review of *A Sand County Almanac* by Aldo Leopold. *Commonweal* 51 no. 77, (October 28, 1949).
[23] *Ibid.*
[24] *Ibid.*
[25] *Ibid.*

This simple citation contains some of the base concepts that would be developed over the next 50 years – the science of ecology and that all natural things are a community, are connected, that would lead to development of the field of biodiversity; that man's presence always changes nature, leading to the development of the wilderness ethic and deep ecology; and it contains the ingredients – integrity, stability and beauty – that are part of every environmental ethical theory.

A review by J. W. H. in the November 27, 1949 issue of the *San Francisco Chronicle Christmas Book Section* calls the book "something quite different" from nature books that are usually about "little birds, wild flowers and flowery prose."[26] The reviewer notes that the book is "obviously a testament of the beliefs of a lifetime rather than a simple book about birds, wood cutting and flowers."[27] The most important part of the book is the Part 3, "The Upshot," according to the reviewer, where Leopold writes "his eloquent plea for a sense of ethics as well as esthetics. This last is aptly stated in the phrase 'ecological conscience.'"[27]

Leopold's idea of wilderness is discussed, as the reviewer claims that "in this matter of wildlife and wilderness, the middle road is not a compromise but

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[26]Review of *A Sand County Almanac* by Aldo Leopold, *San Francisco Chronicle*. (November 27, 1949) 28.

[27]*Ibid.*

another road entirely. Either we must stop tampering with what little wilderness is left, or turn it all into semi-domesticated parks with gravel walks, ashcans and public toilets."[28] The reviewer concludes that many readers will enjoy the first two parts of the book, but skip the "knotty philosophical problem" of Part 3.[29] And this will be their loss, as "these ideas were a man's life, and because of them we can place this book on the shelf that holds the writings of Thoreau and John Muir."[30]

So this reviewer, J.W.H., is the first to place Leopold on the same level as Thoreau and Muir and initially recognize the potential importance of the philosophical issues that Leopold raises. However, the tone of the review seems to portray *A Sand County Almanac* as the lone musings of one man, which it is, without recognizing that the questions raised should be taken more seriously than as just the "last testament" of a man who spent his life working and teaching about conservation.

Joseph Wood Krutch, a very noted author and nature writer, wrote a review titled "Wild Geese – or Television" in the December 24, 1949 issue of *The Nation*, a leading periodical.[31] Krutch gives a brief introduction of Leopold's career and notes that "the little essays which compose this volume were originally published in such obscure places the *Journal of Forestry* and

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[28] *Ibid.*

[29] *Ibid.*

[30] *Ibid.*

[31] Joseph Wood Krutch, review of *A Sand County Almanac*, by Aldo Leopold. *The Nation* 169, no 628 (December 24, 1949).

Wisconsin Agriculturalist and Farmer."[32] He then notes that Leopold has "an original sensibility and a special humorous awareness of the paradoxes of conservation" and quotes the first three paragraphs of the *Foreward*, which end with the sentence: "We of the minority see a law of diminishing returns in progress; our opponents do not."[33]

Krutch explains to according to Leopold, this means the exchange of one thing for another, with conservation attempting to minimize the damages. Leopold celebrates the "therapeutic value" of wilderness and solitude, bemoans that recreational activity has become self-defeating in a mechanized society, and that contemplation is the only activity that does not destroy the outdoors.

Krutch's last paragraph hints at some of the philosophical concerns addressed in the book. "No one could be less fanatical, more moderate, or more reasonable than Mr. Leopold," yet it is obvious that Leopold "had an uncomfortable feeling that he could never see very far ahead, and the discouraging suspicion that he was doing no more than fight a rear-guard action."[34] Thus Krutch tries to capture Leopold's concerns that the conservation movement was doing too little, too late to stop the destruction of natural resources, yet Krutch fails to examine the very articulate and detailed concepts and theories that Leopold writes about in Part 3, especially in the essay *The Land Ethic*.

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[32] *Ibid.*

[33] *Ibid.*

[34] *Ibid.*

In a review published on Christmas Day in the 1949 *Chicago Tribune Magazine of Books*, the review's headline states "Critic Wishes He'd Written This Volume."[35] Reviewer Victor P. Hass states in the first paragraph that if he could have written any book published in 1949, *A Sand County Almanac* would be his choice. Hass wrote that the book "is one of the most beautiful, heart-warming and important nature book to appear in years," and compares it to the contemporary work of *The Twelve Seasons* by Joseph Wood Krutch and *Adventures with a Texas Naturalist* by Roy Bedicheck.[36]

Not quite on the level of Thoreau and Muir, but these are nationally recognized nature writers. Hass noted that Leopold thought watching geese was more important than watching television and that he was proud to be part of a vanishing breed who felt that "'nothing could be more salutary at this stage then a little healthy contempt for a plethora of material blessing.'"[37]

Hass then describes the structure of the book and praises Leopold's writing and prose style. In his final paragraph, Hass notes that it contains "a lifetime of powerful thinking about conservation" and that Leopold has "poured out the essence of a fine mind."[38] In conclusion, Hass writes that the education of future conservationists will not be complete until they have studied the philosophical issues raised by Leopold.

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[35]Victor P. Hass, review of *A Sand County Almanac by* Aldo Leopold. *Chicago Tribune*, (December 25, 1949) 3.

[36]See Bibliography.

[37]*Ibid.*

[38]*Ibid*

One may suspect that Hass is a conservationist, as he claims to wish he had written the book and is on intimate terms with the works of Krutch and Bedicheck. He obviously admires a great deal the writing style and issues discussed by Leopold, which center around conservation. But the conclusion seems to be ambivalent, as it seems to state that even though this is a very good nature book, the philosophical and ethical issues it raises are best left to study by future conservationists, and that the public may have little interest in these issues, a sentiment reflected by the review by J.P.W. in the *Chicago Tribune*.

In a February, 1950 review titled "The Land: With Realism and Poetry" in *The Christian Science Monitor*, Elizabeth Yates called Leopold's essential purpose that of "persuading him [the reader] towards a realization of the delights abounding in the world of nature and convincing him of the need for wisdom and practicality in the preservation of that world."[39] Yates notes that public awareness of "a growing water shortage" [in 1950] may influence more people to read the book. Yates describes the books layou, and calls the writing "at all times unself-conscious, unstudied and movingly beautiful." [40] She particularly notes the essay, *On A Monument to the Pigeon*, with its discussion about extinction, and the essay, *Thinking Like a Mountain*, "will give not only the conservationist but the farmer and the sentimental lover of nature much to ponder deeply."[40]

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[39]Elizabeth Yates, review of *A Sand County Almanac by* Aldo Leopold. *Christian Science Monitor*, (February 6, 1950) 14.

[40]*Ibid.*

"Thinking Like a Mountain" has become a favorite slogan for environmentalists.[41] In the essay, Leopold describes how he and others shoot and kill a female wolf, because in those days, everybody thought killing wolves was a good idea.

> We reached the old wolf in time to watch a fierce green fire dying in her eyes. I realized then, and have known ever since, that there was something new to me in those eyes – something known only to her and to the mountain. I was young then, and full of trigger-itch; I thought that because fewer wolves meant more deer, that no wolves would mean hunter's paradise. But after seeing the green fire die, I sensed that neither the wolf or the mountain agreed with such a view.[42]

Fittingly, the term "fierce green fire" has also become a favorite phrase of the environmental movement to describe its own motivations and consciousness.[43]

Yates described Leopold's philosophy of conservation as that of "a practical man and a poet," a partnership between humans and nature, "the extension of ethics and an ecological conscience from people to land."[44] The following is cited from the essay *The Land Ethic*:

> Conservation is getting nowhere because it is incompatible with our Abrahamic concept of land. We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect. There is no other way for land to survive the impact of mechanized man, nor for us to reap from it the aesthetic harvest it is capable, under science, of contributing to culture.[45]

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[41]Flader, *Thinking Like a Mountain*

[42]Leopold, *A Sand County Almanac*

[43]Philip Shabecoff, *A Fierce Green Fire: The American Environmental Movement* (New York: Hill and Wang, 1993).

[44]Elizabeth Yates, review of *A Sand County Almanac by* Aldo Leopold. *Christian Science Monitor*, (February 6, 1950) 14.

[45]*Ibid.*

The review has highlighted some of what are the essential concepts of Leopold's writings and philosophy, and tries to communicate these to the reader in a serious and timely manner, especially with her reference to current water shortages and how Leopold's conservation ideas address these concerns.

Another well known nature writer, Edwin Way Teale, wrote a review titled "Land Loving" in the March 5, 1950 issue of the *New York Herald Tribune*.[46] Teale describes Leopold as "a thoughtful writer with a gift for beautiful and pliant prose," the book as "quiet and enduring," and says it "is a rare addition to the library of any one who appreciates wise and beautiful writing about nature."[47] These plaudits aside, Teale then writes a laundry list of short descriptions for many of the 37 essays contained in the first two parts of the book, indeed, these make up the majority of the content of the review.

Only in the last two paragraphs does he briefly mention the essays *The Land Ethic* and *Wildlife in American Culture* and interestingly notes that it is Leopold who believes that we must start thinking about the land in a philosophical rather than economic sense. Teale's voice or opinions on these subjects is noticeably absent, and he concludes with a quotation from the *Foreward*. Teale, a leading nature writer, says surprisingly little about the concepts and theories espoused by Leopold, and seems to treat the book as just another collection of essays about the beauty of nature.

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[46]Edwin Way Teale, review of *A Sand County Almanac* by Aldo Leopold. *New York Herald Tribune Book Review* (March 5, 1950) 6.

[47]*Ibid.*

In a very brief review in the April, 1950 issue of the *Canadian Forum*, reviewer Ellen Rogers talks about how Leopold believes that economic evaluation should not be the bottom line for conservation, and she notes that if "he becomes a bit lyrical at times about ducks and such, it is an easy thing to forgive in a sincere nature lover."[48] She does note that Leopold, while working in the U.S. Forest Service, "originated the idea of establishing permanent 'primitive' areas of wood and water."[49] There are virtually no references to land ethics or philosophy.

Hal Borland, another noted nature writer, wrote a review titled "The Land is Good" for the *New York Times* in July, 1950.[50] His lead paragraph bears repeating:

> "This book looks as harmless as a toy glass pistol filled with colored candy. It turns out to be a .45 automatic fully loaded."[51]

Borland calls Leopold's "poetic approach to the out-of-doors" the candy in the toy gun and calls his philosophy of conservation "the powder and the lead, the real thing."[52] Borland writes that Part 1 is the best of outdoor prose writing. Part 2 has the same "singing quality" as Part 1, but is more than just nature writing as it

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[48]Ellen Rogers, review of *A Sand County Almanac* by Aldo Leopold. *Canadian Forum* , (April, 1950).

[49]*Ibid.*

[50]Hal Borland, review of *A Sand County Almanac* by Aldo Leopold. *New York Times* (July 16, 1950) 10.

[51]*Ibid.*

[52]*Ibid.*

"questions piecemeal conservation policies that merely compromise with or slow down forces of destruction" and this prepares the reader for the heavier reading in Part 3.[53] Borland notes that "it is heavy going, but chiefly because Leopold deals with big questions and opposes popular solutions."[54] The range of topics include biotic communities, ecological balance, wilderness cycles and economic health, humility in mankind, and effects of civilization.

Borland concludes that this is "a trenchant book, full of beauty and vigor and bite, a fit testament from and monument to the man."[55] While acknowledging that Leopold may not have all the answers to conservation concerns, he says Leopold's chief purpose was to eloquently explain what was wrong with systems and philosophies that were currently in use.

Borland is first reviewer that seems to realize the tremendous importance of Leopold's book and he emphasized the fact in his somewhat melodramatic lead, basically saying that here is a loaded gun aimed our current conservation efforts, and we need to pay attention.

The March, 1950 issue of *The United States Quarterly Book List* contains a review of the book, which it noted to "form a sort of capstone to the life work of a great American forester, ecologist and conservationist."[56] The reviewer briefly outlines Leopold's philosophy that everything in nature is part of community and

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[53] *Ibid.*

[54] *Ibid.*

[55] *Ibid.*

[56] *United States Quarterly Booklist* 6 no. 7 (March 1950).

that disturbing any part of the community effects all other parts, and mankind is generally doing a lousy job of safeguarding its natural resources. The layout of the book and is contents is briefly given, and the essay *Wilderness* noted because of its idea of setting aside protected areas of primitive wilderness. While this review is fairly accurate and praiseworthy, it does not really impart the sense of concern and immediacy and importance that Borland manages to portray in his review.

Discussion and Conclusion

This is a comprehensive compilation of the major reviews written within a year of the publication of *A Sand County Almanac*. A brief synopsis of the major publications and reviewers show that Leopold's work received a very good reception, with *Kirkus Reviews* being the lone exception:

- *The Commonweal* – Alan Devoe
- *San Francisco Chronicle* – J. P. W.
- *The Chicago Tribune* – Victor P. Hass
- *The Nation* – Joseph Wood Krutch
- *Christian Science Monitor* – Elizabeth Yates
- *New York Herald Tribune* – Edwin Way Teale
- *New York Times* – Hal Borland

Krutch, Teale and Borland were three of the biggest names in nature writing in the 1940s and '50s. Five of the nation's largest newspapers ran reviews, two in their Christmas book review sections. Krutch and Teale both wrote good reviews, but did so in the genre of "nature books" and concentrated on the first two parts of the book, which fit well into that genre. But both fail to explore or extrapolate

the theories and philosophies expressed in Part 3, especially Teale, who seems to try to distance himself from them rather than discuss them. These must be considered the two major reviews because of the reviewers' prominence and the length of the reviews (7-9 paragraphs) and the fact that the *Herald Tribune* ran one of Charles W. Schwartz's illustrations from the book with its review.

Hass claimed that he wished he wrote the book, but similar to J. P. W., both seemed to admire the beauty of Leopold's writing and thinking without really extrapolating or exploring the deeper concepts and theories that Leopold was proposing and discussing.

Yates' review was almost the same length, and while not developing a detailed discussion about Part 3, does seem to have a sharper eye for the importance of issues raised in essays like *Thinking Like A Mountain* and in Part 3 of the book. Similarly, Devoe, in a much shorter review, manages to catch some of the important concepts through the epigrams he chooses to cite.

But is up to Borland to stand up and say "Hey look at this, this is something important." He alone tries to make the reader understand that Leopold is raising important ethical and philosophical questions, and answers, to concerns and problems that involve a whole myriad of issues, such as hunting and fishing, forestry, outdoor recreation, wildlife and game management, man's relationship to not just the farmland and animals but to the earth as whole, including wilderness, and how all of these subjects are part of our social and cultural constructions, including values and ethics.

Looking Back

It is interesting, and a comment on the role of book reviewing, that no reviews of *A Sand County Almanac* were published between 1950 and 1967 as researched in the *Book Review Digest*. It was during these years, especially in the '60s, that the book was becoming recognized, at first as something like a cult classic among the youth "back-to-nature" movement, then as a "must read" among environmentalists, until it reached it status as a classic reference among educators and philosophers dealing with a wide range of biological, ethical and ecological related disciplines.

Leopold's son, Luna, who helped with the final draft of *A Sand County Almanac*, collected more essays from his father's journals and these were published in 1953 as a book titled *Round River: From the Journals of Aldo Leopold*.[57] The two books were combined in 1966 edition as *A Sand County Almanac: With Essays on Conservation from Round River*.[58] In the preface to this book, Luna and his sister, Carolyn Clugston Leopold, write that:

> this generation of Aldo Leopold's grandchildren is rebelling on college campuses, demonstrating and working for social causes, and fighting on foreign soil. This same youth is maturing at that moment of time which is pivotal in the struggle to preserve 'things wild and free' that Aldo Leopold understood so wisely and expressed so eloquently. . . What better way to fight the destruction of nature that to place in the hands of the young this powerful plea for a land ethic?[59]

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[57]Aldo and Luna Leopold, *Round River: From the Journals of Aldo Leopold* (Oxford University Press, 1953).

[58]Aldo Leopold, *A Sand County Almanac: With Essays on Conservation from Round River*.30 (Oxford University Press, 1966).

[59]*Ibid.*

In a review in the September 1967 issue of *Quarterly Review of Biology*, Raymond F. Dasmann noted that *A Sand County Almanac* "has been a major reference for all who are interested in the philosophy of conservation" since its publication in 1949.[60] And in true 1960's style, Dasmann addresses the so-called generation gap:

> If ... you fail to understand why people become emotional about redwoods and whooping cranes ... read at least Part 4 in this new edition ...in which the now familiar terms 'ecological conscience,' 'land ethic' and 'conservation esthetic' are first defined and explored, and in which the significance of wilderness is examined. This is the core of the book.[61]

So 17 years after its publication, *A Sand County Almanac* had reached the status of "hip." As the environmental movement grew, and the field of ecology grew into the multi-faceted exploration of the environment and various areas of study and specialization developed, the wisdom and foresight of Aldo Leopold became even more celebrated, even canonized.

As the fields and disciplines related to environmentalism grew and developed from the 1960s into the new millennium, Leopold has garnered even more recognition and respect as a man who was ahead of his time.

> Leopold wrote forty years ago that the land ethic is a product of social evolution developing through the interplay of emotion and intellect. It will never be complete, he affirmed, for "nothing so important as an ethic is ever 'written.' Only the most superficial student of history supposes that Moses 'wrote' the Decalogue; it evolved in the minds of a thinking community, and Moses wrote a tentative summary of it for a 'seminar.'[62]

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[60]Richard F. Dasmann, review of *A Sand Country Almanac: With Essays on Conservation from Round River*, by Aldo Leopold. *Quarterly Review of Biology* 42, no. 3 (September, 1967) 417.

[61]*Ibid.*

[62]Victor B. Scheffer, *The Shaping of Environmentalism in America*. (Seattle: University of Washington Press, 1991) 176.

Numerous books and articles have been written about the life of Leopold, the effects of *A Sand Country Almanac* on environmental philosophy, ethics and education, and more of his essays have been compiled and published. Many of these are centered around two dates – 1987, the 100th anniversary of his birth, and 1999, the 50th anniversary of the publishing of *A Sand Country Almanac*.[63] On August 11, 1988, the U.S. Congress passed a joint resolution to give special recognition to the birth and achievements of Aldo Leopold.[64]

Historian Donald Fleming described Leopold as the "Moses of the New Conservation impulse of the 1960s and '70s, who handed down the Tablets of the Law but did not live to enter the promised land."[65] Leopold may not have lived to enter the promised land, but he laid the foundations for hope that mankind may still be able to save Eden.

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[63]See Bibliography for a selection of these works.

[64]United States. *Joint Resolution To Give Special Recognition to the Birth and Achievements of Aldo Leopold*. GPO Call No. AE 2.110:100-389. Aug. 11, 1988 (S.J. Res. 40). 102 Stat. 963, Public Law 100-389

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SCIENCE COMMUNICATION INTEREST GROUP

Environmental Threats, Information Sources and Optimistic Bias: Environmental Risk in Appalachia

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Environmental Threats, Information Sources and Optimistic Bias:
Environmental Risk in Appalachia

A 1999 newspaper article identified Appalachian counties in Ohio that had the "deadly distinction" of the highest death rates in the state. Health officials cited poverty, unhealthy lifestyles, and lack of health care as contributing factors, while state and federal data consistently show dangerously high levels of air, land and water pollution and toxicity. One official characterized residents' attitudes: "There is a sort of fatalism in Appalachian people. They say, 'We're all going to die anyway. Something's going to get you, so why bother?'"[1]

This telephone survey study examined perceived environmental risk in Appalachian Ohio, exploring the relationship of perceived risk to "optimistic bias" or "unrealistic optimism,"[2] and to evaluations of sources of environmental information.

Literature Review

Risk: Slovic's review of studies of risk perception showed that most Americans generally see themselves as more at risk today than in the past, and less at risk than they'll be in the future. As individuals, they tolerate higher levels of risk from voluntary activities (choosing to smoke) than they tolerate from involuntary hazards (smokestack emissions from a local power plant); and the riskier a perceived hazard is, the more they endorse strict regulations to reduce it.[3]

This "tolerability" of a risk is sometimes an artifact that, in reality, is evidence of an "optimistic bias" or "unrealistic optimism." Studies examining risk and optimistic bias have focused on AIDS/HIV, smoking, being involved in a motorcycle or auto accident, and adequacy of health care, to name a few.[4]

Weinstein wrote that people "expect others to be victims of misfortune, not themselves. Such ideas imply not merely a hopeful outlook on life, but an error in judgment that can be labeled unrealistic optimism." Weinstein argued that unrealistic optimism is an attempt to avoid anxiety linked to a threat to well–being.[5] Chapin noted that people may psychologically distance themselves from a risk by making "downward comparisons" of themselves to "less fortunate" people (to whom are attributed elevated degrees of risk) to maintain self–esteem. Similarly, individuals also "overestimate" their own skills at avoiding risk (e.g., driving ability), and denigrate the skills of others at risk.[6]

Comparison to Others: Whatever the function—anxiety reduction, maintenance of self-esteem, etc.—one thing is clear: Central to one's calculation of self-risk is a comparison to someone else. Studies often involve different levels of risk judgment (e.g., societal-level risk versus individual risk), or different levels of "psychological distance," using referents of varying familiarity or similarity. Respondents may be asked to compare themselves to what is "average" (e.g., "What is the average person's chance of being a crime victim?" and "What is your chance?"), or to assess the national prevalence of a problem and compare their own likelihood of it (e.g., "How much of a problem is AIDS/HIV for the United States? What do you think is your chance of contracting it?"). Other studies ask respondents to compare themselves to "most people" or a similar generalized other (e.g., "other drivers").

These differences in referent can be pivotal. Chapin's study of urban minority youth, for example, used three referents: a best friend, other students in the same state, and other students across America. As psychological distance increased, so did subjects' optimistic bias with regard to HIV/AIDS risk.[7]

The question of comparison points of reference is particularly germane to this study, which involves specific risk comparison to people "where you live" in Appalachia.

Individual Differences: People's perception of their risk may be viewed as a social and cultural construct; individual differences such as gender, age, and education could affect risk perception (e.g., "That doesn't happen to educated people," or "I've learned to avoid that....").[8]

However, optimistic bias studies that examined gender have produced mixed results. Some found no gender difference.[9] Others have found, for example, that adult men are more optimistic than adult women about cancer risk from smoking.[10] Other studies show unrealistic optimism about particular risks increases with age, presumably because lack of experience with a risk over time is equated with lack of risk of ever experiencing it.[11] Quadrel, Fischoff and Davis, for example, showed adults more optimistic than their children about a variety of risks, including environmental risk; parents and children both tended to view the parent as being less at risk: "In fact, both the parents and the children believed that the adults were more invulnerable than the teenagers were."[12]

However, Salwen and Dupagne, studying the "Y2K" phenomenon, found age an important predictor, but "*Younger* respondents believed that Y2K will cause more problems for other people than themselves" (emphasis added).[13]

Based on other studies' findings that firsthand and even secondhand experiences of bad events can lead to greater sense of vulnerability, Rutter, Quine, and Albery used "experience" in a study of motorcyclists' perception of risk but found that optimism actually increased with experience of negative events. The authors speculated that the

finding might be attributable to the respondents' survival despite prior risky behavior, which indicated that they may view risk more positively (e.g., "taking chances," or "living on the edge") than others who most often behave in less risky fashion.[14] On the other hand, those who've experienced negative events may simply be weighing "quasi-statistical" probabilities, in the belief that "lightning never strikes twice in the same place."

The Nature of the Risk: Research also shows that the type of "risk event" affects one's view of his or her risk, though that effect may itself be related to individual differences, as noted above. Slovic suggests that a deadly accident may produce little social disturbance if it occurs as part of a familiar and well understood system, such as a train wreck, while a small accident in an unfamiliar system, such as a nuclear reactor meltdown, may cause a great deal of social disturbance if it is perceived as a sign of things to come.[15]

Weinstein found that people who thought a problem was particularly serious were less likely to be optimistic about their own susceptibility, as were people with more experience with a problem, suggesting that event type has a powerful effect.[16] Harris suggested that unrealistic optimism, or biased risk assessment, varies from event to event because of perceived controllability, low perceived probability, the extent to which the event is associated with a stereotype of the typical victim, and the extent to which people believe that previous lack of exposure to it implies immunity.[17]

The Role of Media: Researchers have also examined exposure to risk messages, or beliefs about the quality of media coverage of a risk, as they might be related to optimistic bias. Tyler and Cook, for example, found that exposure in an experimental setting to mass media communications on crime did result in increased estimation of

societal risk but not judgments of personal risk.[18] In his study of at-risk urban minority youths, Chapin found that content-specific knowledge, media use, and attitudes toward the media were not significant predictors of optimistic bias.[19] In a study of views of health care, Culbertson and Stempel found that perceived favorability of media coverage did not play a significant role in assessment of one's own health care but did affect assessment of health care at the societal level.[20] Salwen and Dupagne found that overall amount of television viewing (but not television *news* viewing) was related to optimistic bias about Y2K. "Respondents who watched more television believed that Y2K problems are more likely to happen to other people than to themselves." Newspaper coverage was negatively related, and evaluation of quality of coverage was unrelated.[21]

Background of Current Study

Appalachia's 200,000 square miles encompass parts of 13 states, including 29 counties in Southeast Ohio. In the 1960s, Appalachia was called a "region apart, geographically and statistically," from the rest of the country because of its rugged terrain, low incomes, lack of urbanization, and deficits in education and living standards.[22] Although conditions have improved, much of Central Appalachia, including Southeast Ohio, still suffers the "realities of deprivation" identified in 1964 and remains "among the worst-off places in the nation."[23]

Ohio is the seventh most-populated state.[24] Its electric power plants release more emissions to land, air, and water than any other state's,[25] and it ranks fourth for total toxic industrial releases,[26] eleventh for number of hazardous waste sites, and twelfth for amount of coal produced.[27] Meanwhile, it ranks thirty-ninth in the country for spending on environmental regulation[28] and forty-fifth for state investment in public health.[29]

This study focuses on six Appalachian Ohio counties in the Ohio River valley—Belmont, Gallia, Lawrence, Meigs, Monroe, and Washington. The counties possess a mix of environmental, health, and economic pressures.[30] Mining and manufacturing provide many jobs, including work in such "dirty" industries as chemical and petrochemical refining. Leading employers are WHX/Wheeling Pittsburgh Steel; Dow Chemical; Union Carbide; Intermet Ironton Iron; Ormet Corp.; BP Amoco Corp.; DuPont; Royal Dutch Shell/Shell Chemical; Elkern Metals; and Pioneer Pipe.[31]

Collectively, the counties account for 2.3% of Ohio's population, 7% of its land area, 8% of its hazardous waste sites, 8% of its toxic chemical wastes, 16% of its toxic chemical releases, 23% of its air emissions, and 24% of its total power plant emissions.[32]

Further, the counties are poor.[33] In each, the poverty rate is higher than the state average, the per capita income is below the state and national averages, and the unemployment rates are higher than state and national rates. Four of the six are among Ohio counties with the highest rates for not having health insurance. Only one percent of the state's physicians practice in the six-county region.

Research Questions

Based on the research reviewed briefly above, three research questions were posed for this initial inquiry into environmental risk among Appalachian residents.

RQ1: What is the level of environmental risk perception among Appalachian residents?

RQ2: Is there unrealistic optimism about environmental health threats when risk comparisons involve others in the same place?

RQ3: How does media use and information source evaluation relate to environmental risk perception?

Method

Trained student interviewers using computer-assisted-telephone-interviewing equipment phoned 2,626 randomly selected numbers purchased from a commercial firm and proportional to the six counties. Over 1,600 of the numbers were non-working, were answered by answering machines, or were not answered at all. Of the 946 calls that yielded a connection, 405 (45%) were completed (with 51 partial completions, the rate is 48%). A conservative estimate of the sampling error associated with a probability sample of 405 is +/- 4.8% at the 95% confidence level.

Interviews "with the next adult over 18 who will celebrate a birthday" were conducted in a single week (Sunday through Thursday) from 6:30 p.m. until 9:30, and lasted approximately 15 minutes each. Interviewees were asked a series of questions about environmental conditions in general, about a number of environmental problems specifically, and about the adequacy of information provided by government(s), businesses or companies, and local news media. Because of our focus on these Appalachian counties, questions about risk to self and other were framed within a decidedly local context ("where you live"). The general questions included:

> Generally speaking, do you think the condition of the environment where you live has gotten better, stayed about the same, or gotten worse?
>
> Generally speaking, how serious are environmental threats to the quality of life where you live?
>
> How serious do you think environmental threats are to the health of most people where you live?
>
> How about you personally? How serious do you think environmental threats are to you personally?

How worried are you personally that you will develop health problems related to environmental threats?

Next, respondents were asked whether 14 separate environmental problems—ranging from nuclear waste to water quality—were a serious problem "in the area where you live." Table 1 presents the 14 hazards or problems. Demographic and media use data were also collected, along with data on respondent evaluation of the performance of government, businesses and companies, and local news media, in delivering environment-related information.

Results

The final sample percentages from each county closely matched the proportional county distribution in the sampling frame: Belmont (25% obtained, 26% in listing), Gallia (11% obtained vs. 12%), Lawrence (21% vs. 21%), Meigs (9% vs. 12%), Monroe (3% vs. 6%) and Washington (31% vs. 23%). As often happens, the sample overrepresented females (just over 60% as compared to Census data of 51%) in five counties, though female sample representation was identical to Census figures for the largest county (Washington). The sample was overwhelmingly white: 97% of respondents were white, a figure higher than Ohio's overall 86%, but consistent with the five counties' Census racial distributions (all ranged from 95% to 99% white).

Respondent ages ranged from 18 to 88 (mean=49). Forty percent were Democrats, 32% were Republican, and 28% were Independent or other party. Sixteen percent had not completed high school, while 51% were high school graduates, and 13% claimed college diplomas, a figure lower than Ohio's 17% but consistent with the six-county Census average of 12.6%. Nearly two-thirds (63%) were married and 36% had

children under 18 living at home. Forty-four percent reported church attendance within the previous week; 61% claimed Protestant faith. Four of ten (41%) reported household income under $25,000 annually (including 14% under $10,000), 25% reported $25,000-$40,000, 19% reported $40,000-$60,000, and 15% reported more than $60,000.

RQ1: What is the level of environmental risk perception among Appalachian residents?

Table 1 provides data on respondent evaluations of general and specific environmental conditions where they live. One-fourth believed that environmental conditions had deteriorated during the past few years. Given the region's environmental "history," the 50% reporting that conditions had "stayed about the same" represents faint praise; in fact, only one in five reported that conditions had improved. Seven out of ten viewed environmental conditions as "somewhat" or "very" serious threats to the "quality of life" (71%) and the "health of most people" (73%) where they live. Yet only 64% viewed environmental conditions as threats to their ***own*** health, an indication of "optimistic bias" or "unrealistic optimism." Just over half (51%) were worried that they would develop health problems related to those threats.

RQ2: Is there unrealistic optimism about environmental health threats when risk comparisons involve others in the same place?

While these proportional comparisons (73% to 64%) illustrate perceived self-other differences in risk from environmental conditions, it is also possible to test for differences in means between responses to the two survey questions (though the items' 1-4 scoring is not in any strict sense an interval measure). A paired t-test between means for "the health of most people" (mean=3.0) and "your health personally" (mean=2.88) yields a t value of 3.28 (396 d.f.) that is statistically significant (p=.001).[34]

In regard to one specific health risk *not* tied directly to the environment, when respondents were asked to assess the risk of heart disease for others where they live and for themselves, they again provided an even more generous estimate of others' risk and an even more conservative one for themselves: 79% viewed others as somewhat or very likely to develop heart disease (mean=3.34), while only 62% (mean=2.81) saw themselves at similar risk (t=9.11, 345 d.f., $p<.001$). As noted earlier, a number of functional explanations (anxiety reduction, self-esteem maintenance, etc.) have been advanced for such optimism, as have a number of mechanisms, such as overestimation of one's risk-avoidance skills or healthful behaviors. Indeed, while a majority (61%) of our respondents said "people where you live" are "somewhat" or "very likely" to have an annual medical checkup (mean=2.76), 86% (mean=3.49) said they *themselves* would have an annual examination (t=-12.59, 389, $p<.001$).

RQ1, RQ2, and the Total Environmental Problems Score (TEPS)

To elaborate **RQ1** about perception of level of environmental risk, respondents were also asked to assess how serious specific environmental threats are "in the area where you live," using a four-point scale (not serious at all, not very serious, somewhat serious or very serious). The problems, adapted from a 1995 statewide survey,[35] included extinction or disappearance of native plants and animals, nuclear waste disposal, outdoor air pollution, and industrial dumping. Table 1 reports the percentages of respondents identifying problems as serious (combining "somewhat" and "very") where they live. Problems are presented in descending order of "seriousness."

The primacy of the first three problems (declining water quality, industrial dumping, and working with dangerous materials) comes as no surprise to those familiar

with the area. As we noted above, these Ohio River valley counties are characterized by mining, chemical and petrochemical operations—all notoriously "dirty." Acid mine runoff and spillage of industrial waste chemicals are familiar and recurring problems.

There is redundancy among some of these problems, but for the purposes of constructing an overall environmental problems "index," we retained all 14 items. Each was dichotomized and scored as a "0" if identified as "not very serious" or "not serious at all," but scored as a "1" if identified as "somewhat" or "very serious." The summed "Total Environmental Problems Score" (TEPS) thus ranged from 0-14, with a mean of 7.6 problems and a median of 7 problems.

Reliability analysis of the TEPS scale was satisfactory (***alpha***=.81). As a crude test of its validity, TEPS was used as a dependent measure in a one-way ANOVA (also in Table 1), based on whether respondents felt environmental conditions had gotten better, worse, or stayed the same in recent years. The mean TEPS for respondents reporting that conditions had remained the same or gotten better was 7.1 problems, but for those reporting declining conditions, the TEPS was significantly higher (8.9; F=10.05 [2,395], p=.001).

Next, the distribution of the TEPS was examined and used to construct three levels of perceived risks. The low risk level included 122 respondents scoring 0-5 on the TEPS, the middle level included 122 respondents scoring around the 7.6 mean (6-8 serious problems), while the higher risk level included 165 respondents scoring from 9 to 14 on the TEPS.

When **RQ2**'s unrealistic optimism about environmental health risk ("most people" and "your health personally") was re-examined for these three TEPS levels, we found a

"specification" of this relationship. First, though, note that the means on both the measures (self and other) increased monotonically with each TEPS risk level (2.58, 2.97 and 3.33 for "most people"; 2.48, 2.78 and 3.25 for "your health personally").

It is ***within*** TEPS levels, though, that the specification occurs. A pairwise t-test within the low risk group (between "most people" and "you personally") yielded a *non*-significant *t* (1.28, 118 d.f., p=.20). In the middle risk group the test yielded a significant *t* (2.76, 115 d.f., p=.007), but in the high risk group, *t* was again *non*-significant (1.79, 161 d.f., p=.08). In other words, among those in this sample whose responses indicate that they are the least at risk (low TEPS), there was no significant unrealistic optimism. Meanwhile, the TEPS middle risk group did exhibit significant optimistic bias. However, among those arguably the *most* at risk—the high-level TEPS group—the perceptions of risk to self and to others are not significantly different. Those who perceived the most environmental threats where they live do not see themselves as significantly more at risk than others who live there. Recall Chapin's finding (among at-risk urban youths) that optimistic bias increases with psychological distance;[36] our high-TEPS respondents were unable to distance themselves from others living there. Recall also Weinstein's observation that people who thought a problem was particularly serious were less likely to be optimistic about their susceptibility, as were people with more experience with a problem.[37]

Table 2 examines the relationship of TEPS level to general statements about the environment's condition and threats posed to quality of life, to "most people," and to the respondent. The data are presented as simple percentages by TEPS level, with chi-square measures of association for each bivariate analysis. In addition, "raw" TEPS means are

provided for each row variable in the tables, with *F*-scores for one-way ANOVAs among rows. Admittedly, there is redundancy in the presentation (indeed, the entire discussion of unrealistic bias in Table 1 is elaborated by the data), but our goal was to illustrate relationships *and* to gain some sense of the validity of the TEPS.

The data show that "raw" TEPS (with the *F*-score) and TEPS level (with the chi-square) are in each case significantly related to the general belief statements. Those who perceive more environmental problems where they live see the environment worsening in recent years; are more likely to see environmental threats to the quality of life and health of "most people" where they live; and are more likely to see their own health at greater risk. The TEPS mean scores indicate that the relationships are monotonic as well.

RQ3: How does media use and information source evaluation relate to environmental risk perception?

Table 3 explores media use data, usefulness of information sources about environmental issues, and assessment of environmental knowledge, salience, and efficacy.

There is a monotonic, but not statistically significant, pattern in the respondents' daily television use, with higher TEPS level respondents reporting 3.58 hours of television viewing per day. There is no relationship between TEPS and days per week of viewing a local or regional newscast, or minutes of daily newspaper reading. There also is no clear association of these media use variables and rating of local media as sources of environmental issue information. *F* was significant for newspaper reading and rating of local media performance, but the pattern is curvilinear.

Indeed, when TEPS is controlled for three different sources of environmental information (government, businesses and companies, and local media), none of the values

of chi-square is significant. Government receives slightly higher ratings (52% "somewhat" or "very good") among the low TEPS level respondents than among the middle (38%) and high risk (39%) respondents. They in turn give poorer ratings to businesses and companies as sources (63% of middle level and 68% of high level respondents rate businesses and companies "somewhat" or "very poor").

The between-level comparisons are suggestive, if not statistically significant. What is most pronounced in the rating of information sources is the favorable ratings of "local newspaper, radio and television" compared to government and businesses and companies. Overall, 72% of respondents rated local media "somewhat" or "very good," compared to 42% for government and only 37% for businesses and companies. The favorable local media ratings were fairly consistent across TEPS levels (71%, 75% and 71%, respectively).

Table 3 also provides data on three measures of respondent perception of environmental knowledge level, salience, and efficacy, adapted from Einsiedel and Thorne.[38] Respondents were asked to indicate how well each statement describes them: 10 indicates a perfect description while 1 indicates the opposite. The resulting overall scores of 6.21 for knowledge, 3.9 for salience, and 3.21 for efficacy lack context, until TEPS level is controlled. Those perceiving more environmental threats where they live see themselves as more knowledgeable and as more concerned about the environment ("important to me"). Those at medium and high TEPS levels see themselves as less resigned to environmental problems ("not much we can do"). While the differences among means on the first two statements are monotonic, none of the three ANOVAs is significant at the .05 level.

Table 4 revisits the examination of performance by sources of environmental information, controlling for respondent view on environmental conditions (better, worse, same) and threats. Not surprisingly, there is a significant association between view of environmental change and rating of government as a source of environmental information: 75.5% of those who believe the environment where they live has gotten worse rate government as "somewhat" or "very" poor as a source, compared to 52% of those who feel conditions have stayed the same and 43% of those who feel conditions have improved. A similar association exists with rating of businesses and companies as sources: 77% of those who believe conditions have worsened rate businesses and companies "somewhat" or "very" poor, while smaller majorities among the "gotten better" and "stayed the same" groups gave negative ratings. While ratings of local media lean toward the same pattern, no significant association exists.

When seriousness of environmental threats to quality of life is controlled, the same pattern emerges—to a point. Those who see environmental threats to quality of life as more serious tend to provide significantly more negative ratings of government, businesses and companies, as before, but ***also*** to local media. However, when the focus turns to threats to "most people's" health and "your own health," seriousness of threat is significantly associated with negative source evaluations ***except*** for local news media.

Discussion and Conclusions

The goals of this study were modest: to examine risk perception in a distinct geographic region, a region for which there are many stereotypes and assumptions about its residents' "fatalism" in accepting and living with environmental threats. The study used a cross-sectional survey of only five Appalachian Ohio River counties that consistently are

ranked at or near the top for Ohio in terms of environmental hazards, health care inadequacy, and death rates. Its measures of opinions and beliefs about risk need validation. The question of "fatalism," of course, was not addressed.

Despite these limitations, the study has answered several research questions about the perception of environmental health risk *for* Appalachian Ohioans *among* Appalachian Ohioans. At minimum, it has shown those perceptions are rich and "multi-dimensional" (e.g., the 14 environmental problems that made up the TEPS) and it has asked those at potential risk to assess risk "where you live," and not to a generalized "average."

Few surveyed believe environmental conditions have improved in recent years and most view conditions as serious threats to quality of life and health of people where they live. Fewer viewed those conditions as threats to their ***own*** health, an indication of "optimistic bias" or "unrealistic optimism," or the general tendency to overestimate likelihood of negative events befalling others relative to one's own risk. The study found that unrealistic optimism about general environmental risk is related to one's ***specific*** environment and how many specific risks are present: Optimistic bias varies depending on one's TEPS.

Those in the sample the least at risk (low TEPS) did not exhibit unrealistic optimism; those in this group may realize that risk is low for one and all. The TEPS middle-risk group did exhibit unrealistic optimism. But among the high-level TEPS group—those who are most at risk in terms of sheer number of identified hazards—perceptions of risk to self and others are not significantly different. Might it be that the sheer number of perceived risks for the high TEPS group precludes erecting a defense against such a threat to well-being? Does our use of a referent "other" whose

"psychological distance" is down the street rather than across the nation affect high TEPS responses? Rather than unjustified optimism, do high-risk respondents "realistically," and perhaps with some comfort, report similar risk for others? After all, the high TEPS group reported greater salience of and knowledge about environmental issues; the group's realistic assessment of the distribution of risk may be a function of knowledge. Does the middle-risk group, neither convinced like the low-risk group that it faces relatively few risks, nor resigned to the "fate" of the high-risk group, employ the optimistic bias mechanism in order to deal with its ambiguity and relative (to the others) uncertainty?

Those who responded that there are more environmental problems where they live also see the environment worsening in recent years; are more likely to see environmental threats to the quality of life and health of "most people" where they live; and are more likely to see their own health at greater risk.

Those who responded that there are fewer environmental problems where they live (low TEPS), are generally more favorable in their view of government as a source of environmental news than are those with more problems in their backyards. Not surprisingly, those with higher TEPS give poorer ratings to businesses and companies as sources of environmental news

However, and somewhat surprising in an era of media-bashing, "local newspaper, radio and television" fared fairly well as environmental information sources, compared to government and businesses and companies and across TEPS levels. As could be expected, one's view of whether environmental change has been positive or negative in recent years affects one's rating of government as a source of environmental information. A similar association exists with rating of businesses and companies as sources, but not to ratings of

the media. Those who see environmental threats to quality of life tend to view negatively government, businesses and companies, but not local media. When the focus turns specifically to threats to "most people's" health and "your own health," more negative evaluations are directed to government and business, but not to local news media.

Finally, perhaps one of the most intriguing findings is this relatively positive view of the local media's role in providing information about environmental threats and issues. The distinct geographic location of the study sample might explain this finding: While government agencies are made up of the expert sources that most of us rely on to explain environmental dangers, and while government regulators are the enforcers we count on to protect us from such dangers, suspicion of government is often associated with rural and Appalachian culture. Further, negative views of "exploitative" businesses and companies are as old in Appalachia as company mining towns.

Local news media, sometimes dismissed as lapdogs of those companies, businesses and (local) government, enjoy a position of trust as sources of environmental information, at least for the Appalachian Ohio River valley residents studied here.

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[1] The Associated Press, "Appalachian Area Has Deadly Distinction," *The Athens Messenger* Sept. 7, 1999, p. 1.

[2] Neil D. Weinstein, "Unrealistic Optimism About Future Life Events," *Journal of Personality and Social Psychology* 39(1980): 806 – 820.

[3] Paul Slovic, "Perception of Risk," *Science* 236 (April 17, 1987):280-285.

[4] R. Alcalay, "The Impact of Mass Communication Campaigns in the Health Field," *Social Science Medicine* 17 (1983):87-94; L. Henriksen and J.A. Flora, "Third Person Perception and Children: Perceived Impact of Pro– and Anti–Smoking Ads," *Communication Research* 26 (December 1999):643-665; D.R. Rutter, L. Quine, and L.P. Albery, "Perceptions of Risk in Motorcyclists: Unrealistic Optimism, Relative Realism and Predictions of Behavior," *British Journal of Psychology* 89 (1998):681-696; Ola Svenson, "Are We All Less Risky and More Skillful Than Our Fellow Drivers?" *Acta Psychologica* 47 (1981):143-148; T.R. Tyler and F.L. Cook, "The Mass Media and Judgments of Risk: Distinguishing Impact on Personal and Societal Level Judgments," *Journal of Personality*

and Social Psychology 47 (1984):693-708; and Hugh M Culbertson and Guido H. Stempel III, "'Media Malaise': Explaining Personal Optimism and Societal Pessimism About Health Care," *Journal of Communication* 35 (spring 1985): 180–190.

[5] Weinstein,"Unrealistic Optimism About Future Life Events," 1980.

[6] John R. Chapin, "Third-person perception and optimistic bias among urban minority at-risk youth." *Communication Research* 27 (February 2000): 51–81.

[7] Ibid.

[8] Neil D. Weinstein, "Perceptions of Personal Susceptibility to Harm," in V. Mays, G. Albee, and F. Schneider (eds.), *Psychological Approaches to the Primary Prevention of Acquired Immune Deficiency Syndrome* (pp. 142–167). Newbury Park, CA: Sage, 1989.

[9] See, for example, Thomas J. Darvill and Ronald C. Johnson, "Optimism and Perceived Control of Life Events as Related to Personality," *Personality and Individual Differences* 12(1991): 951–954, and K. Fontaine and S. Smith, "Optimistic Bias in Cancer Risk Perception: A Cross National Study," *Psychological Reports* 77(1991): 143 –146.

[10] V. Strecher, M. Kreuter, and S. Kobrin, "Do Cigarette Smokers Have Unrealistic Perceptions of Their Heart Attack, Cancer and Stroke Risks?" *Journal of Behavioral Medicine* 18(1995): 45–54.

[11] Neil D. Weinstein, "Unrealistic Optimism About Susceptibility to Health Problems: Conclusions from a Community–Wide Sample," *Journal of Behavioral Medicine* 10(1987): 481 –500. Weinstein found no correlation between comparative risk judgments and age, gender, job status, and education. Weinstein first identified the belief in exemption from future risk in this study, asserting that, for many hazards, "an optimistic bias is introduced into comparative risk judgments when people extrapolate from their past experience (not having experienced a problem) to conclude that their future vulnerability is relatively low. Such extrapolation appears more likely when a problem is believed to have a hereditary origin (and to appear in childhood), when a problem is seen to be a matter of bodily resistance, or when it is thought to have a behavioral or emotional origin." P. 496. See also Chapin, "Third Person Perception and Optimistic Bias Among Urban Minority At–Risk Youth," 2000.

[12] M. Quadrel, B. Fischoff, and W. Davis, "Adolescent (In)vulnerability," *American Psychologist* 48(1993): 102 –116.

[13] Michael B. Salwen and Michel Dupagne, "Optimistic Bias and the Third–Person Effect: Public Estimations of Y2K on Self and Others," paper presented at the Association for Education in Journalism and Mass Communication convention, Communication Theory and Methodology Division, Phoenix, Arizona, August 2000, pp. 16-17..

[14] Rutter, Quine, and Albery, "Perceptions of Risk in Motorcyclists: Unrealistic Optimism, Relative Realism and Predictions of Behavior," 1998.

[15] Slovic, "Perception of Risk," 1987.

[16] Weinstein, "Unrealistic Optimism About Future Life Events," 1980.

[17] Peter Harris, "Sufficient Grounds for Optimism?: The Relationship Between Perceived Controllability and Optimistic Bias," *Journal of Social and Clinical Psychology* 15 (1996): 9–52.

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[19] Chapin, "Third Person Perception and Optimistic Bias Among Urban Minority At–Risk Youth," 2000.

[20] Culbertson and Stempel, "'Media Malaise': Explaining Personal Optimism and Societal Pessimism About Health Care," 1985.

[21] Salwen and Dupagne, "Optimistic Bias and the Third–Person Effect: Public Estimations of Y2K on Self and Others," 2000.

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[24] "Ohio Environmental Statistics and Indicators." At www.pepps.fsu.edu/segip/states/OH/stats.html.

[25] Clear the Air, "State Rankings for Electric Power Plant Emissions, 1998 TRI [U.S. Environmental Protection Agency Toxic Release Inventory] Data." At http://www.cleartheair.org.

[26] U.S. Environmental Protection Agency, "1998 Toxic Release Inventory: Ohio." At http://www.epa.gov/tri/tri99/state/Ohio.pdf.

[27] "Ohio Environmental Statistics and Indicators." At www.pepps.fsu.edu/segip/states/OH/stats.html.

[28] Ohio Environmental Statistics and Indicators." At www.pepps.fsu.edu/segip/states/OH/stats.html.

[29] J. Nick Baird, "Public Health in Ohio: A Status Report," a report prepared for the Ohio Department of Health, 1999. At http://www.odh.state.oh.us.

[30] The town of Cheshire, Ohio, located in Gallia County, offers an example of the extent of the environmental issues facing the counties included in this survey study. In a landmark case in corporate environmental actions, American Electric Power Co. recently purchased the entire town for $20 million, after years of residents' complaints about power plant emissions, and two years after the U.S. Environmental Protection Agency accused the company of violating the Clean Air Act. The government had already bought out about two dozen neighborhoods in the town since 1973 because of environmental problems. See the *New York Times*, "Utility Buys Town it Choked Lock, Stock and Plume," May 13, 2002, page A1.

[31] Ohio Department of Development, "Employment by Industry, State and County Profiles," 1999. At http://www.odod.state.oh.us/osr/profiles.

[32] Population and land data collected from Ohio Department of Development Office of Strategic Research 2000 Census at http://www.odod.state.oh.gov; hazardous waste information from "HazDat Database," Agency for Toxic Substances and Disease Registry, at http://www.atsdr.cdc.gov; toxic chemical release information from U.S. Environmental Protection Agency, "1998 Toxic Release Inventory: Ohio;" and electrical power plant emission data from Clear the Air, "State Rankings for Electric Power Plant Emissions, 1998 TRI Data."

[33] Ohio Department of Development, "Country Profiles," at http://www.odod.state.oh.us/osr/profiles.

[34] Paired t-tests between means for "health of most people" (mean=3.0) and "how worried are you personally that you'll develop health problems related to environmental threats" (2.53) also yields a larger difference that is also significant ($t=10.53$, 400 d.f., $p<.001$). However, the wording of the "how worried" statement varies enough from the "how serious" format of the first statement to make us reluctant to argue its comparability. Given some of the operationalizations of optimistic bias discussed earlier, however, such caution may be unnecessary.

[35] These items were adapted from a questionnaire designed for a 1995 statewide survey conducted by the Ohio Comparative Risk Project. For details, see: Ohio Environmental Protection Agency, *Ohio State of the Environment Report* (Columbus, Oh: Ohio Environmental Protection Agency, December 1995).

[36] Chapin, "Third-person Perception and Optimistic Bias Among Urban Minority At-Risk Youth," 2000.

[37] Weinstein, "Unrealistic Optimism About Future Life Events," 1980.

[38] Edna Einsiedel and Bruce Thorne, "Public Responses to Uncertainty," in Sharon M. Friedman, Sharon Dunwoody and Carol L. Rogers, eds., *Communicating Uncertainty: Media Coverage of New and Controversial Science* (Mahwah, N.J.: Lawrence Erlbaum, 1999), 43-57.

Table 1
Opinions on Local Environmental Quality
In Five Appalachian Ohio Counties
(N=407)

	Better	Same	Worse	D/K
Over the past few years, do you think the condition of the environment where you live has gotten better, stayed about the same, or gotten worse?	% 21	% 50	% 26	% 3

	Not At All	Not Very	Some what	Very	D/K
Generally speaking, how serious are environmental threats to the quality of life where you live?	% 4	% 24	% 42	% 29	% 1
How serious do you think environmental threats are to the health of most people in the area where you live?	6	20	40	33	2
How about you personally? How serious do you think environmental threats are to your health personally?	11	23	34	30	2
How worried are you personally that you'll develop health problems related to environmental threats?	17	31	33	18	1
How likely are people where you live to develop heart disease?	2	6	39	40	13
How likely are you to develop heart disease?	18	15	35	27	4
How likely are people where you live to have a yearly checkup?	15	20	35	27	2
How likely are you to have a yearly medical checkup?	10	4	15	71	0

Paired t-tests between means:

"health of most people" (3.0)-"your health personally" (2.88): **t=3.28, 396 d.f., p=.001**

others' likelihood of heart disease (3 34)-"how likely are you" (2.81): **t=9.11, 345 d.f., p<.001**

others' likelihood of annual medical checkup (2.76)-"how likely are you" (3.49): **t=12.59, 389 d.f., p<.001**

(more)

Table 1 (continued)

How much of a problem is each one of these in the area where you live:	Percentage Identifying as Serious[1]
	%
Declining water quality in lakes, rivers and streams	85
Improper disposal or dumping of industrial or factory chemicals	75
People having to work with dangerous materials as part of their jobs	73
Unacceptable outdoor air quality because of pollution	66
Declining quality of water in underground wells	62
Accidental spills or leaks of chemicals	60
Unacceptable quality of drinking water	57
Exposure to lead	56
Lack of garbage or trash disposal facilities	53
Abandoned industrial sites	50
Indoor air quality problems because of asbestos or radon	48
Improper disposal of nuclear waste	47
Abandoned mines	43
Disappearance of native plant and animal species	40

Summed Total Environmental Problems Score (TEPS)[2]
Mean=7.6; Median=7; **alpha=.81**.

Over the past few years, do you think the condition of the environment where you live has gotten better, stayed about the same, or gotten worse?	Mean TEPS/s.d. (n)
Gotten better	7.1 / 3.6 (85)
Stayed the same	7.1 / 3.5 (205)
Gotten worse	8.9 / 3.1 (108)

F=10.05 (2,395), p=.001

(risks)	TEPS Level: Low (0-5)	Medium (6-8)	High (9-14)
How serious do you think environmental threats are to the health of most people in the area where you live? *mean*:	2.58	2.97	3.33
How about you personally? How serious do you think environmental threats are to your health personally? *mean*:	2.48	2.78	3.25
paired t=	**1.28**	**2.76**	**1.79**
(d.f.)	**(118)**	**(115)**	**(161)**
p=	**.20**	**.007**	**.08**

[1] Combines "Somewhat Serious" and "Very Serious" responses. Other options were "Not Very Serious" and "Not Serious at All."

[2] For each of the 14 items, respondents were scored "0" if they indicated a risk was "Not Very Serious" or "Not Serious at All," and "1" if they indicated a risk was "Somewhat" or "Very Serious." The 14 items were summed, yielding a 15-point total risk score.

Table 2
Opinions on Local Environmental Quality, by Environmental Problem Score (TEPS)[1]

		TEPS Level: Low	Medium	High	
Over the past few years, do you think the condition of the environment where you live has gotten better, stayed about the same, or gotten worse?	*n*=(120)	(119)	(163)	
		%	%	%	mean[2]
	Gotten worse	14	26	37	8.9
	Stayed same	63	53	42	7.1
	Gotten better	23	21	20	7.1
	chi-square=19.7, 4 d.f., p=.001				**F=10.05, p=.001**
How serious are environmental threats to: the quality of life where you live?					
	Not serious at all	9	1	1	4.0
	Not very serious	43	23	10	5.4
	Somewhat serious	29	50	50	8.2
	Very serious	18	26	39	8.8
	chi-square=68.12, 6 d.f., p=.001				**F=27.8 p=.001**
the health of most people?					
	Not serious at all	16	3	2	3.7
	Not very serious	29	21	11	6.3
	Somewhat serious	36	51	39	7.5
	Very serious	19	25	49	9.2
	chi-square=60.15, 6 d.f., p=.001				**F=27.9 p=.001**
to your health personally?					
	Not serious at all	18	9	4	4.9
	Not very serious	36	24	16	6.4
	Somewhat serious	28	48	33	7.7
	Very serious	18	20	48	9.2
	chi-square=58.32, 6 d.f., p=.001				**F=22.9 p=.001**
How worried are you personally that you'll develop health problems related to environmental threats?					
	Not at all	34	11	9	5.4
	Not very	39	38	22	6.7
	Somewhat	21	36	41	8.6
	Very	7	15	29	9.4
	chi-square=66.27, 6 d.f., p=.001				**F=25.4 p=.001**

[1] The summed total environmental problems scale (TEPS), as per text and Table 1, was broken into approximate thirds, based on the number of problems identified as serious: 0-5, 6-8, and 9-14.
[2] The mean for the TEPS (0-14), as per text and Table 1, before it was broken into thirds. The F statistic is for a oneway anova among means.

Table 3
Media Use Measures and Information Source Performance,
by Environmental Problems Score (TEPS)

		TEPS Level.:		
	Overall	Low	Medium	High
n=	(405)	(120)	(119)	(163)
Media use *mean scores:*				
Hours of daily television:	3.44	3.28	3.39	3.58
			F=n.s.	
Days per week of local news:	4.53	4.51	4.47	4.58
			F=n.s.	
Minutes daily newspaper reading:	24.36	22.77	25.49	24.71
			F=n.s.	

How good a job have your local newspaper, radio or television station done informing people where you live about environmental issues?

		Very Poor	Somewhat Poor	Somewhat Good	Very Good
Mean hours television	(n=395)	2.9	3.5	3.4	3.7
Mean days tv news	(n=395)	3.9	4.6	4.6	4.7
Mean minutes reading	(n=395)	15.3	31.6	22.9	28.1
			F prob.=.02		

Table 3 (continued)

	Overall *n*= %	TEPS Level: Low (120) %	Medium (119) %	High (163) %	Environ. Problems mean
How good a job in informing people where you live about environmental issues:					
Government					
Very good	6	6	5	7	7.8
Somewhat good	36	46	33	32	8.1
Somewhat poor	36	28	41	38	7.2
Very poor	21	20	21	23	8.9
DK/not sure	5		chi-square=n.s.		
Companies and businesses involved					
Very good	4	7	4	2	5.8
Somewhat good	33	39	32	30	7.0
Somewhat poor	34	30	37	35	8.0
Very poor	29	25	26	33	8.2
DK/not sure	4		chi-square=n.s.		F prob.= .006
Local newspaper, radio, television					
Very good	23	27	24	19	7.0
Somewhat good	49	44	51	52	7.9
Somewhat poor	17	15	16	18	7.9
Very poor	11	13	9	11	7.7
DK/not sure	3		chi-square=n.s.		

Environmental Problems:

	n= mean	Low (120) mean	Medium (119) mean	High (163) mean
Mean self-assessment scores, where 10 means statement describes R perfectly and 1 means statement does not describe at all:				
I consider myself knowledgeable about the environment.	6.21	6.0	6.2 F prob.=.06	6.4
Knowing about the environment really isn't that important to me.	3.90	4.4	4.1 F prob.=.31	3.4
There's not much we can do about the environment.	3.21	3.7	2.9 F prob.=.07	3.0

Table 4

Source Performance "Informing People Where You Live About the Environment," by Perceived Environmental Conditions

	Environment has:	Gotten Better (n=81) %	Stayed Same (n=197) %	Gotten Worse (n=102) %
Government				
	Very poor	14.8	16.2	35.3
	Somewhat poor	28.4	36.0	40.2
	Somewhat good	50.6	39.6	21.62
	Very good	6.2	8.1	2.9
		chi-square=29.1, 6 d.f., p=.001		
Companies and businesses				
	Very poor	24.7	21.9	42.7
	Somewhat poor	35.8	33.7	34.3
	Somewhat good	37.0	39.3	20.4
	Very good	2.5	5.1	3.7
		chi-square=19.0, 6 d.f., p=.001		
Local media	Very poor	9.8	7.9	14.3
	Somewhat poor	22.0	15.3	15.2
	Somewhat good	43.9	52.0	50.5
	Very good	24.4	24.8	20.0
		chi-square=5.9,6 d.f., p=.42		

Environmental threats to quality of life are:

	Not Serious[1] (101) %	Somewhat Serious (174) %	Very Serious (109) %
Government			
Very poor	16.8	16.7	33.9
Somewhat poor	33.7	36.8	35.8
Somewhat good	42.6	41.4	22.9
Very good	6.9	5.2	7.3
	chi-square=19.1, 6 d.f., p=.004		
Companies and businesses			
Very poor	23.1	22.1	43.0
Somewhat poor	31.7	38.4	31.6
Somewhat good	39.4	36.6	21.1
Very good	5.8	2.9	4.4
	chi-square=21.5, 6 d.f., p=.001		

[1] Because of the small number of cases responding "Not Serious At All," the original "Not Serious At All" and "Not Very Serious" categories were combined to form the "Not Serious" option. This did not change the pattern of significant and non-significant associations originally observed.

Table 4 (continued)

Environmental threats to quality of life are:

	Not Serious (101) %	Somewhat Serious (174) %	Very Serious (109) %
Local media			
Very poor	9.7	6.9	18.3
Somewhat poor	11.7	18.3	19.1
Somewhat good	46.6	55.4	42.6
Very good	32.0	19.4	20.0
	chi-square=18.3, 6 d.f., p=.006		

Environmental threats to people's health are:

	Not Serious (96) %	Somewhat Serious (165) %	Very Serious (123) %
Government			
Very poor	16.7	18.2	30.1
Somewhat poor	38.5	33.9	37.4
Somewhat good	38.5	44.2	23.6
Very good	6.3	3.6	8.9
	chi-square=18.3, 6 d.f., p=.005		
Companies and businesses			
Very poor	21.0	24.1	40.9
Somewhat poor	34.0	36.4	32.3
Somewhat good	39.0	36.4	22.8
Very good	6.0	3.1	3.9
	chi-square=17.2, 6 d.f., p=.009		
local media			
Very poor	8.0	9.1	15.6
Somewhat poor	13.0	18.9	17.2
Somewhat good	49.0	53.0	44.5
Very good	30.0	18.9	22.7
	chi-square=9.53, 6 d.f., p=.14		

Table 4 (continued)

Environmental threats to your own health are:	Not Serious (128) %	Somewhat Serious (93) %	Very Serious (115) %
Government			
Very poor	14.1	18.4	33.0
Somewhat poor	41.4	34.8	32.2
Somewhat good	37.5	43.3	27.8
Very good	7.0	3.5	7.0
	chi-square=18.7, 6 d.f., p=.005		
Companies and businesses			
Very poor	20.1	26.6	40.5
Somewhat poor	34.3	39.6	28.4
Somewhat good	40.3	30.9	27.6
Very good	5.2	2.9	3.4
	chi-square=15.9, 6d.f., p=.014		
Local media			
Very poor	8.3	7.9	16.8
Somewhat poor	13.5	20.7	16.0
Somewhat good	51.1	52.1	45.4
Very good	27.1	19.3	21.8
	chi-square=10.64, 6 d.f., p=.10		

Context in print and online environmental articles

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Abstract

A content analysis of environmental articles in leading U.S. dailies revealed that few of nine types of context examined were included in the printed version of the articles. None of the newspapers were using the potential of the Internet consistently to add more context to their environmental articles online. In fact, fewer contextual elements appeared online than in the print versions.

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In recent decades, Americans have become increasingly concerned with the interaction of our society and the environment (Askari, 1995) and have looked toward the news media to keep them informed on that interaction. About 81% of Americans depend on the media for environmental news, according to one survey (Kennett, 1993). To quench the public thirst for information, the news media have increased the amount of coverage of environmental issues (Foundation for American Communications [FACS], 1993). With the dawn of the "environmental decade" in the 1970s came the formation of environmental journalism with the purpose of conveying environmental issues to the public (Shoenfeld, 1980). Since then, environmental journalism has established itself as a legitimate field of reporting with a large audience. Some large newspapers now employ more than half a dozen writers to cover the environment (Chepesiuk, 1993).

Although coverage of environmental issues has been popular for more than three decades, critics say this coverage is wrought with problems. One common complaint is that the media don't put issues into proper context; quotes are taken out of context, and current work is not related to other research (Walters, 1996). The World Wide Web gives news organizations the potential to correct this flaw (Tenenbaum, 1997). While some news organizations use the same articles in their print and online versions, others have taken advantage of the Internet's potential to provide more information to readers. In addition to the ability to run longer, more in-depth articles, some online versions of newspapers like *The New York Times* and *The Christian Science Monitor* link articles to archived material on the same topic (Fredin, 1997). Some organizations use links to other information sources, such as government databases, that add greater context, depth, and texture to online stories (Pavlik, 1997). Other news organizations have included court transcripts, search warrant documents, wiretap transcripts of drug dealers, and other features online that would be impossible in print (Pavlik, 1997). To compete as a news medium, newspaper journalism on the Internet must fully exploit the medium's basic properties (Fredin, 1997).

This study examines what types of context the leading U.S. daily newspapers include in their environmental coverage and whether they are using the potential of the Web to improve context in their coverage. Print and online environmental articles appearing in *The New York Times, The Los Angles Times, The Washington Post, USA Today,* and *The Christian Science Monitor* are examined. Additionally, differences in context among newspaper titles are analyzed.

Literature Review

In 1947 the Hutchins' Commission (The Commission on Freedom of the Press) called for a new kind of journalism. The first duty of newspapers was "to give an accounting of the day's events in a context that gives them meaning," according to recommendations the commission published (Commission for Freedom of the Press, 1947, p. 20). More than 50 years later, critics contend that the media still fail to put issues in proper context (Griffin, 1992). These criticisms are especially loud for environmental reporting. Trying to report complex, controversial, scientific issues well is difficult (Cowen, 1985; Garrison, 1992), and the limited space of the print medium exacerbates these problems. To report on the environment, journalists must educate themselves regarding controversial issues that even experts do not often completely understand (Fischoff, 1996).

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A 1993 survey of journalists showed that only 3% considered current environmental coverage to be "very good," and 40% rated it as "good," (FACS, 1993). Incorporating more context into stories regarding the environment is among the improvements sought by experienced environmental journalists (Cowen, 1985). Salomone, Greenberg, Sandman, & Sachsman, 1990). Giving background information that helps readers put issues in context in relation to their lives is an important part of journalism. If journalists fail to do so, readers are not likely to understand events and grasp their significance and potential consequences (Griffin, 1992).

The importance of context

Context, defined as coherent analysis that helps makes complex topics understandable, is necessary in newspaper reporting because of competition from other media such as television and radio, which offer little context (McCleneghan, 1997). Newspapers must add more perspective, analysis, and interpretation to the news to be different from other media by adding more depth to the news (McCleneghan, 1997). Because of the limitations of the print medium, newspapers struggle to compete with the timeliness of television and radio. What newspapers can offer that those mediums cannot or commonly do not is analysis and interpretation. A good analytical news story creates understanding by showing that what happens in one time or place is related to what happens in other times and places (Hart, 1994). Context is important because research has shown that readers learn more from articles with background and context included (Griffin, 1992). Readers can miss out on the relative importance of the issue if an article on a scientific subject fails to include some background information. Articles need to contain full perspective and background of an issue or they may harm the credibility of scientists and journalists (Burkett, 1986). Omitting information from an article may lead to distortion of the issue (Burkett, 1986), which could in turn lead to a biased representation of the issue.

Observers offer various causes for the lack of context. First, in contrast to the deliberative nature of scientific inquiry, newsrooms are fast-paced workplaces where information is processed and passed along as quickly as possible. Because of these differences, information passed along by the media in news stories fails to fully explain issues or at least explain them in a manner acceptable to scientists (Salomone, 1990). A second cause for the lack of context is journalists' poor sense of scientific information (Keating, 1997). Once reporters have been on the environmental beat for a significant amount of time, they tend to move on. New, lesser-experienced journalists who are unable to provide context and competent reporting replace them (Keating, 1997). And third, even experienced journalists are constrained from writing long articles with ample context by the cost of newsprint, which accounts for 20% of a newspaper's expenses and affects the profitability of newspapers (Vivian, 2001).

How context can be included in articles

Hart (1994) outlines three ways to include context in articles. First, journalists should make historic connections to events, placing the current issue in historical context. Second, writers can draw other, similar examples, the same way a reviewer compares movies. Third, reporters can add averages or statistics that describe the overall situation. Graphics can also add context to articles. Topics as wide ranging as space shuttles to bypass surgery are all made easier to understand with the inclusion of photographs, schematics, and illustrations

(Garrison, 1992). Repeatedly giving the contextual information of an article to the reader helps people make sense of complex issues. Research has shown that readers learn the most from articles with repetitive contextual information interwoven in the article and also written in a separate text box accompanying the article (Griffin, 1992). These techniques helped people understand foreign news better than if they read articles with no background information or articles with contextual information in text references or pull out graphics alone (Griffin, 1992).

The Internet and Journalism

Science, health, finance, and technology draw the most attention from people going online for news (The Pew Center, 1998a), which may mean environmental journalism has a potential to draw a large readership online. The Internet holds the promise of allowing print journalism to break free of its traditional limitations, which in turn could lead to more context online (Pavlik, 1997). The Internet's strengths include the immediacy and ability to break and update news as it occurs, the nearly limitless news hole, the ability to include references and links to more information, the interactivity available for readers, and the ability to archive information. Each of these is examined in turn.

Immediacy. The potential to break stories immediately sets the Web apart from print media. So many major stories have been broken on the Internet before they have come out in print that news of such occurrences has become redundant (Fitzgerald, 1998). Lasica urges frequent updates: "Online news should be about getting current news and information to people when they want it or need it, not when it's convenient . . .What matters to readers is staying on top of local and national events . . . adding context, background, balance, and perspective to events as they unfold" (1997, p. 48). The Why Files, a science news site based at the University of Wisconsin-Madison, did just that in its 1996 coverage of the wildfires across the United States. A linked map of fire-burned areas changed daily as the fire-damaged areas grew (Tenenbaum, 1997).

Unlimited space. Adding words or other information online is virtually free. Salon.com once ran a 6,000-word article that was rejected by *The New Yorker* as too lengthy (Lasica, 1998). The nearly unlimited capacity to store and print information online can be especially helpful in conveying scientific issues because graphs and diagrams make scientific subjects much easier for the public to understand (Garrison, 1992). An example of the larger news hole being put to use is the addition of the full text of court depositions and other official documents online to enhance news articles (Fitzgerald, 1996). And some outlets, such as CNN, are offering up to 10% original content not available anywhere else in print or through television (Pavlik, 1998). A 1999 survey of online editors found that some used the limitless space of the Web to give expanded news coverage. But by a 3 to 2 margin, online editors showed preference for limiting the amount of information provided online compared to the print product (Peng & Tham, 1999).

References and links. Occasionally Web articles contain reference material and links with more information for readers. These outside links can be to other articles on the same topic or they can be to outside Web sites that provide a perspective to the reader unavailable in a print version of the article (Pavlik, 1997). However, providing outside links does not necessarily mean additional information in an article. A 2000 study

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found that 25% of print newspaper articles appearing in major newspapers contain URLs, or Web addresses (Trumbo & Trumbo, 2000). This study found that, rather than adding context to stories by giving URLs to information sites, most print versions of newspapers seemed to be providing URLs to commerce sites rather than government or educational sites aimed at providing more background material (Trumbo & Trumbo, 2000). Peng and Tham (1999) found that nearly all online newspapers provide links to outside sources, yet fewer than half linked to other news sites.

Interactivity. While traditional newspapers can offer a means of projecting different opinions through letters to the editor, the Internet offers an instant forum for communication. The interactive capabilities of the Internet allow readers to communicate with one another in chat rooms immediately after reading an article, should the Web editors provide that service. After the school shooting in Littleton, Colorado, journalist Jonathan Dube spent hours chatting online with more than 1,600 readers. He was able to convey facts that hadn't fit into his articles and, in effect, created a new article that the readers helped shape with their questions (Dube, 1999).

Audio and Video. Online newspapers do not have to rely on the traditional format of newspaper articles because they are able to use new technologies like audio and video. Real-time audio and video technologies have been available since 1997 when RealNetworks introduced "streaming" technology (Williams, 2000). Online newspapers have made limited use of these technologies. Gubman and Greer (1997) found that only 14.5% of online newspapers used audio, video or animation in their news sections. *The Washington Post* used these capabilities when reporting on Hurricane Bonnie (Featherly, 1998), and *The Los Angles Times* has used video and audio technologies to enhance articles on other issues (Phipps, 1998). Editors at *USA Today* and other large newspapers have created content-exchange deals with television stations owned by the same company to have access to video footage for their Web sites (Williams, 2000).

Archiving. Another way in which the Internet may help provide context to readers is through archiving information. Online editors can link all of the articles the newspaper has written on a particular subject from the most current article on that subject. A 1998 survey found that people go online for news for exactly this reason, to search for news about a particular topic. This was the third most common reason people looked online for news behind finding information unavailable elsewhere and convenience (The Pew Center, 1998b). Archiving articles may be a good idea for online editors. If consumers can't find the information they want from local newspapers online, they will go to other news sites like MSNBC or CNN (Lasica, 1997). A survey by the Pew Research Center (1998b) found that readers were already beginning to turn to other news sites, with the national broadcast station Web sites being more popular than national newspaper Web sites.

Research questions

With all of the potential, it is still unclear if and how newspapers are using the Web to convey more scientific information to readers. Factors such as time and cost-benefits may prohibit print media from using the Web to add more context to environmental issues. Singer (1997) found that coverage of the 1996 presidential election by Denver's two daily newspapers available online actually was less than that provided in print in an analysis of two major newspapers. One of the newspapers only provided 6% of the election coverage online that

it did in print, while the other published about 15% of the coverage on its Web site (Singer, 1997). One explanation given by managers at the newspapers for this is that the election was national news available many places on the Internet and that their niche was local news. The study also found that the articles that did appear online were rarely different than the print version. Thus, despite the opportunity to run a longer version of the articles, they had already been cut by the editors and went into the online version as they appeared in print (Singer, 1997).

This study asks if the same patterns are found in environmental coverage. Are newspapers running longer articles, adding reference material, adding graphics and images, updating material, immediately breaking news, adding external links, and using interactivity to improve context in environmental news coverage? The following research questions are posed to shed light on the issue:

- RQ1: How much and what type of context do leading U.S. daily newspapers provide in their print versions of environmental articles?
- RQ2: Does context in print articles vary by newspaper title?
- RQ3: Are leading U.S. daily newspapers taking advantage of the Internet's capabilities to provide more context in online versions of environmental articles than in the print versions?
- RQ4: Does the difference between print and online context vary by newspaper title?
- RQ5: How does presence of an adversarial frame relate to the amount of context provided?

Method

A content analysis was conducted to get a picture of what is typical in both print and Web coverage of the environment in leading U.S. dailies.

Population and sample

As of early 2001, more than 3,400 U.S. newspapers had online versions of their newspapers (Newslink, 2000). Most of the articles on the Web sites are exactly the same as those that appeared in the print version, (Fredin, 1997; Houston, 1999) a publishing method known as "shovelware" (Thalhimer, 1994). Large national newspapers are more likely to experiment with different content on their Web version than the print version (Fredin, 1997). Gubman and Greer (1997) found that only 15.7% of newspapers with an online version used linked boxes and non-linear storytelling methods on the articles appearing on the Web. They also found that only 14.5% used multimedia such as audio or video in their news articles, although multimedia was being used on their sites in advertising. This study found that large newspapers were more likely than small newspapers to use these features.

Singer, Tharp, and Haruta (1998) showed that larger newspapers were more likely to have separate staff members for online operations. Cole (1975) selected from the nation's largest newspapers to draw a sample of science articles under the presumption that the larger newspapers have the capability to hire science writers. In addition, Trumbo (1995) used a sample of leading newspapers because their articles are likely to be reprinted in many other smaller newspapers owned by the same company, increasing the influence of the large, prestigious

newspapers. For these reasons, this study used leading national newspapers to determine if differences exist in articles between print and online versions, and to examine differences among newspapers.

The four opinion-leading newspapers in the country are *The New York Times*, *The Wall Street Journal*, *The Washington Post*, and *The Los Angles Times* (Krantz, 1994). *USA Today* has a larger circulation than any of these (Vivian, 2001). Because *The Wall Street Journal* is a business newspaper rather than a general interest national newspaper like the others (Vivian, 2001), *USA Today* was used in this study in place of *The Wall Street Journal*. The influence of *USA Today* is strong because of its size and because of the distribution of its stories in other Gannett newspapers (Vivian, 2001). *The Christian Science Monitor*, another national newspaper, also was chosen because of its depth in science and environmental coverage.

The most efficient way to get a representative stratified sample of the content of a daily newspaper for a given year is to gather two constructed weeks of data (Riffe, Lacy, & Fico, 1998). Cole (1975) used three constructed weeks from each of three years--1951, 1961, and 1971--to measure trends in science news coverage. However, McMillan (2000) found that most Web content analyses emphasize a particular time frame because the changing site content necessitates rapid data collection. The fleeting nature of the Web and the lack of uniformity in how newspapers archive their content, necessitated a fixed time period of data collection for this study, which was the three week period from February 22 to March 14, 2001.

Lacy, et al. (1991) used the type of purposive sample this study will use to compare conflict coverage among 12 large circulation newspapers in a study similar to this one. This method was appropriate because, although not random, it was intended to compare certain context in coverage among newspapers and between print and online editions. Lacy, et al. (1991) compared conflict coverage among the 21 newspapers with a mean of 16 articles from each newspaper. This study attempted to collect at least 40 articles from the print version of each newspaper, enough from each title to perform meaningful statistical analyses.

Unit of analysis

Each print version of an environmental article collected during the sample period was one unit of analysis and the Web version of the article was another. Each version of an article got its own code sheet. The entire article was analyzed because of the way variables were measured. All environmental articles identified in the print version of the newspaper were included in the study. If the article was subsequently identified on the newspaper's Web site, that version was included in the study as well.

Any environmental article with a byline in the main news section, business section, local news section, lifestyle section or science section of the newspaper was used. Articles in the advertising sections of the newspapers were not used. As with other newspaper research, opinion/editorial pieces were not included (Li, 1999). The study analyzed only articles produced by the newspaper's staff and not those by a wire service used in the newspapers. This decision was based on the assumption that online editors would be more likely to invest resources in improving articles produced by their own staff and not those from a service. Only articles with bylines were used, as briefs and other short articles are frequently taken from wire services. Even if the staff writes the briefs, the articles are unlikely to be enhanced for the Web.

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For the this study, environmental articles were those that regarded any of the following: air pollution, water pollution, solid waste, deforestation/logging, endangered species, population growth, government departments such as the Environmental Protection Agency or the Department of Interior including state-level agencies, natural resources, urban sprawl, animal rights, invasive species, biotechnology, genetically engineered food, ecology, mining, global warming, wildlife, wilderness areas, national parks, national forests, environmental racism, eco-feminism or any other topic germane to the environment. To be used in the study, the article had to have a major focus, which revealed itself in the headline or first five paragraphs, (Boyle, 1995) on one of the topics listed above. Articles that only mentioned briefly environmental issues were not included.

During the collection period, two coders tracked the print newspapers for any environmental articles. Next, coders looked for articles on the respective newspaper's Web site. Only environmental articles on the Web site that had a print counterpart were coded. During the collection period, only two articles were found online and not in print. One was an advertorial; the other included a page number for the print edition, suggesting that it was inadvertently left out of the print version. Reliability between the two coders on 10% of the stories (N = 41) ranged from 87% (N = 2) to 100% (N = 16), with an average of 96%.

Context

The context errors that scientists note the most in reporting of their work are quotes taken out of context, lack of reference to other research, and a lack of perspective of the issue (Walters, 1996). Because interviews with quoted individuals would have been required to determine whether quotes in the articles were used in proper context, that criteria of context was not measured in this study. Past research has conceptualized and measured context in several other ways. This study borrows nine of these, each coded as present (1) or not present (0). These measures are summarized below.

- Reference to research the article is based on. One study found that 40 percent of science articles are significantly different than the research on which they are based (Walters, 1996). A reference to research appearing anywhere in the article including photograph captions and cut-lines was coded as present. Links to the original research in the Web version also were coded as present.
- Historical context. Hart (1994) suggested other ways to add context to news, including adding historical information.
- Comparison using similar examples. Hart (1994) suggests writers draw other, similar examples to issues to add context, the same way a reviewer compares movies.
- Reference to other research. This study also coded for reference to other research that pertained to the topic in each article.
- Sources of more information. Whereas print newspapers are limited in the amount of information they provide, the Web allows more information to be included and linked to. The presence of sources where readers could find more information, such as telephone numbers or Web addresses, was recorded.

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- Three types of visual elements. Readers can understand science better with the aid of photos, diagrams, maps, and other visual aids (Tenenbaum, 1997; Griffin, 1992; Garrison, 1992). Three variables were examined in this category: 1) maps, 2) photographs, 3) diagrams or illustrations. In addition, the total number of visual elements accompanying a story was recorded.
- Audio and video. Current technology allows for visitors to watch videos or listen to audio clips provided by Web sites (Williams, 2000). These formats may enhance environmental issues in the same manner as still visuals. Any audio or visuals included in a story were recorded. Because audio and video are not possible in print editions, this variable was automatically coded as not present in print articles.

Three other variables also were examined. First, to compare overall context, the nine variables above were summed to produce a context score. Second, article length was measured in number of paragraphs. If a difference was found between the print and online editions, the articles were examined word-by-word to determine whether actual differences existed in the story length. Finally, the presence of an adversarial frame was noted. An adversarial frame is dichotomy or duality in an article. The most obvious feature of this is representation of issues in terms of two distinct, mutually exclusive camps (Karlberg, 1997). Cole (1975) coded science newspaper articles for the presence or absence of conflict. If there was a mention of at least one antagonist or contradictory, opposing sides of an issue or a reason for conflict, then the article was coded as having conflict. This study coded for any presence of an adversarial frame in the same manner, either present or not present.

Results

During the sample period, 215 environmental articles were coded from the print versions of the five newspapers. Of the articles, 96% (N = 206) appeared on the Web. Only 4% (N = 9) of the articles appeared in print only, adding to a combined total of 421 coded articles from print and the Web. *The Los Angles Times* had the most articles during the period and *The Christian Science Monitor* had the least. *The Christian Science Monitor* and *The Washington Post* transferred 100% of the articles in the sample to the Web; *USA Today* transferred the smallest percentage (see Table 1).

Table 1. Newspaper articles online and in print.

Newspaper	Print	Online (percent transferred online)	Total
USA Today	44	39 (89%)	83
Los Angles Times	58	56 (96%)	114
New York Times	50	48 (96%)	98
Christian Science Monitor	19	19 (100%)	38
Washington Post	44	44 (100%)	88
Total	215	206 (96%)	421

RQ 1: How much and what type of context do leading U.S. daily newspapers provide in their print versions of environmental articles?

Of the eight variables related to context that could be included in a print article, historical information was the most frequently occurring in the sample. The least likely context variable to be included was maps, closely followed by sources for more information (see Table 2). Audio and video, of course, were not present in any of the articles, but this variable included for later comparison to online articles.

Table 2. Types of Context included in print environmental articles.

Context variable.	Percent of articles containing this form of context.
Historical information	74% (N = 159)
Photos	49% (N = 106)
Similar examples	45% (N = 97)
Reference to research	28% (N = 60)
Reference to other research	25% (N = 54)
Diagrams/illustrations	23% (N = 50)
Sources of more information	15% (N = 32)
Maps	14% (N = 29)

A context score was created for each article by combining the total of the nine possible context variables present in that article. The score could theoretically range from 0, meaning the article contained none of the context variables, to 9, meaning it contained them all. Audio and video obviously contributed a zero to this score for all print articles, meaning they could only range in score from 0 to 8. The mean context score for all of the print articles was 2.73 (median = 3, mode = 2).

The number of visual elements and paragraphs in the articles also was recorded. The mean number of paragraphs was 22 (median = 20, mode = 24). The mean number of photographs per article was 0.83 (median = 0, mode = 0). The mean number of maps per article was 0.19 (median = 0, mode = 0). The mean number of diagrams or illustrations per article was 0.42 (median = 0, mode = 0).

RQ 2: Does context in print articles vary by newspaper title?

A one-way analysis of variance (ANOVA) demonstrated a significant difference between newspapers for the number of diagrams and illustrations included in print articles ($F(4, 211) = 3.53$, $p < .01$) and for number of paragraphs in print articles ($F(4, 212) = 3.58$, $p < .01$). A slight, but not significant difference was found for the total context score of print articles ($F(4,211) = 2.03$, $p < .10$).

Post hoc analyses using Tukey's HSD demonstrated that, for the number of diagrams and illustrations, *USA Today* ($M = 0.95$) had significantly more present in articles than the *Los Angles Times* ($M = 0.31$, $p < .05$). *USA Today* also had significantly more diagrams and illustrations than *The New York Times* ($M = 0.32$, $p < .05$) and *The Washington Post* ($M = 0.27$, $p < .023$), and slightly more than *The Christian Science Monitor* ($M = 0.16$, $p < .06$).

For story length, post hoc analyses also demonstrated that *The Los Angles Times* had significantly more paragraphs ($M = 27$) than *USA Today* ($M = 17$, $p < .003$). The rest of the newspapers' mean number of paragraphs fell between those scores.

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Differences in the total context score were approaching significance between *USA Today* (M = 3.09) and *The Washington Post* (M = 2.2, $p < .06$) with the other three newspapers falling between those scores.

Other differences in the context provided in the newspapers appear when comparing each discrete type of context. Crosstab analysis displayed a significant difference in references to research included in the print articles of the newspapers ($\chi^2(4) = 23.65$, $p < .001$). *USA Today* was twice as likely as expected to include a reference to research the article was based on, while the rest of the newspapers were less likely than expected to include this information.

Crosstabs analysis also displayed a significant difference for presence of historical information ($\chi^2(4) = 12.21$, $p < .05$). *USA Today* was less likely to include this information than expected, while *The New York Times* and *The Washington Post* were more likely than expected to include historical information. *The Los Angles Times* and *The Christian Science Monitor* provided this information almost exactly as much as their expected values indicated.

A significant difference in which newspapers included photographs with their print articles also was found ($\chi^2(4) = 14.96$, $p < .01$). *USA Today* was less likely than expected to include photographs with articles, while *The New York Times* and *The Christian Science Monitor* were more likely to include photographs than expected.

Significant differences also emerged for sources for more information ($\chi^2(4) = 13.41$, $p < .01$). *USA Today* was twice as likely as expected to provide these sources, while *The Washington Post* was six and a half times less likely than expected to do so. The other three newspapers provided sources of more information in proportion to what was expected.

RQ3: How does presence of an adversarial frame relate to the amount of context provided?

An independent samples t-test found that the average structural context score for articles in the entire sample written in an adversarial frame (M = 1.84) was significantly lower than for articles not written in an adversarial frame (M = 2.97, $t(419) = 6.79$, $p < .001$). Articles with an adversarial frame were significantly less likely ($\chi^2(1) = 16.82$, $p < .001$) than those without an adversarial frame to contain a reference to research the article was based on. Articles with an adversarial frame were also significantly less likely than those without an adversarial frame to have a similar example of the issue used as a comparison ($\chi^2(1) = 7.33$, $p < .01$), to have a reference to other pertinent research ($\chi^2(1) = 8.78$, $p < .01$), to have diagrams or illustrations ($\chi^2(1) = 7.04$, $p < .01$), or to provide sources of more information ($\chi^2(1) = 5.67$, $p < .05$). No significant difference was found between adversarial and non-adversarial articles for historical information, photographs, or maps.

Adversarial and non-adversarial articles did not differ significantly on the number of photographs, number of maps, or number of paragraphs included. But the number of diagrams and illustrations in adversarial articles (M = .14) was significantly lower than the number appearing in non-adversarial articles (M = .53, $t(213) = 2.31$, $p < .023$).

RQ4: Are leading U.S. daily newspapers taking advantage of the Internet's capabilities to provide more context in online versions of environmental articles than in print versions?

Independent samples t-tests compared the mean number of photographs, maps, diagrams and illustrations, audio and visual elements, and total context scores. Print articles had a higher average number of photographs and maps than online articles. No other significant differences were found (see Table 3).

Table 3. Average number of context elements appearing online v. print.

Variable	Mean	
	Print	Online
Number of photos?	.83	.51[1]
Number of Maps?	.19	.07[2]
Number of diagrams?	.42	.46
Number of audio/video?	.00	.05
Number of paragraphs?	21.82	21.85
Total context score	2.73	2.62

[1] $t(419) = 3.03$, $p < .01$; [2] $t(419) = 1.98$, $p < .05$

Crosstabs analyses were run on the discrete context variables to compare each for print and online versions. Far fewer online articles contained photographs than expected ($\chi^2(1) = 10.82$, $p < .01$). Online articles also were significantly less likely than expected to include maps ($\chi^2(1) = 9.3$, $p < .01$) and diagrams and illustrations ($\chi^2(1) = 5.17$, $p < .05$). Online articles had more sources for more information than expected ($\chi^2(1) = 15.65$, $p < .001$). No other differences were found between print and online versions.

RQ5: Does context online compared to print vary by newspaper title?

Crosstabs analyses were conducted to determine if articles in the five newspapers were more likely to contain any of the nine context variables in their print or online versions. Independent samples t-tests were conducted between the online and print versions of each newspaper to determine if there was a significant difference in the number of photographs, number of maps, number of diagrams or illustrations, or total context score.

Print articles in *USA Today* were more likely than online versions to include photographs ($\chi^2(1) = 8.81$, $p < .01$). When *USA Today* articles had photographs, the number accompanying print articles ($M = 0.75$) was significantly greater than the number accompanying online articles ($M = 0.15$, $t(81) = 2.4$, $p < .05$).

Print articles in *The Los Angles Times* were more likely than online articles to contain maps ($\chi^2(1) = 8.85$, $p < .01$). Articles in *The Los Angles Times* had a significantly greater number of maps when they appeared in print ($M = 0.79$) than when they appeared online ($M = 0.64$, $(112) = 3.07$, $p < .01$). The print articles in that newspaper also had a significantly greater number of diagrams and illustrations ($M = 0.31$) than the online articles ($M = 0.13$, $t(112) = 2.03$, $p < .05$).

Online *The Washington Post* articles included photographs significantly less often than expected ($\chi^2(1) = 5.73$, $p < .05$). Articles in this newspaper had a significantly greater number of photographs when they appeared in print ($M = 0.61$) than when they appeared online ($M = 0.18$, $t(86) = 2.87$, $p < .01$). Online articles from *The*

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Washington Post were significantly more likely than expected ($\chi^2(1) = 14.97$, $p < .001$) to contain sources for more information.

Online *The Christian Science Monitor* articles were more likely than expected to have sources for more information ($\chi^2(1) = 5.73$, $p < .05$). Online articles in *The New York Times* also were significantly more likely than expected to have sources for more information ($\chi^2(1) = 3.98$, $p < .05$). No other differences were found between print and online for these newspapers.

Summary of findings

Nearly all of the environmental articles that appeared in print were transferred to the Web, with two newspapers, *The Christian Science Monitor* and *The Washington Post*, transferring all of their environmental articles to the Web.

All of the eight possible types of context were found in at least a small percentage of the print articles. On average, articles included less than three of the story components that can add context. The most common component was historical information, followed by photographs; maps were the least common type of context included. The mean number of paragraphs per article was 22, and some had more than 90 paragraphs, fairly long for newspaper articles.

The individual newspaper titles varied in the amount of context they provided in their print environmental articles. Despite having the shortest articles, *USA Today* had the highest context score and was the most likely to include a reference to research the article was based on. *USA Today* had more diagrams and illustrations than the other newspapers. While only 15% of the articles provided sources for more information, *USA Today* was far more likely to do so than the others. *The Washington Post* was far less likely to do so. *The Los Angeles Times* had significantly more paragraphs in environmental articles than *USA Today* but not the other newspapers. *The New York Times* and *The Washington Post* were more likely than the other newspapers to include historical information. The study revealed that stories presented with an adversarial frame included less context overall than non-adversarial articles.

None of the newspapers appear to be using the potential of the Internet consistently to add more context to their environmental articles. In fact, fewer contextual elements appeared online than in the print versions. This is true only for visual elements, such as photographs and maps, and not for text elements like references to research and historical context. Because in most cases the text appearing online was identical to what appeared in print, some elements of context appeared online in the same abundance as in print. The only way that more context was included with articles appearing online was if sources of more information not found in the print version were included. Often, these were links to more information and, in many cases, were links to previous articles published on the site. Overall, the online versions of articles were more likely to have sources for more information. Among newspaper titles, *The Christian Science Monitor, The New York Times,* and *The Washington Post* articles were significantly more likely to provide sources of information online than in print.

Implications

Because there is no baseline to compare it to, it is difficult to make a statement about the amount of context provided in environmental articles in the leading U.S. daily newspapers. The average context score of 2.73 for print articles appears low considering that a total score of 8 was possible (with audio and video excluded). It is hard to imagine an article containing two references to research, a similar comparison, historical information, a map, a diagram, a photograph and a place for readers to find more information without taking up a considerable amount of space in the newspaper and considerable resources from the staff. To look at this result in the best light is to say that the leading newspapers provide some degree of context in their environmental articles based on what the critics say is missing. They also provide all types of context but not all in each article. To look at it another way, it is likely the newspapers could work to include more of these context variables in each article, as the average article is lacking many of the attributes of context.

Frequently included forms of context. The newspapers are doing a good job of providing context in the form of historical references, photographs, similar examples used as a comparison, and diagrams and illustrations. The presence of historical references outnumbering other types of context is not surprising. Reporters may be familiar with an issue because they have written about it before, making it easy to include historical information. Photography is of course a major part of journalism, so the large percentage of environmental articles that contained photographs is not surprising. Almost half of the articles compared the issue featured to a similar issue. Nearly a quarter of the environmental articles included a diagram or illustration, most likely a larger percentage than for newspaper articles in general. As stated above, observers have argued that science-based issues are often best explained with diagrams and illustrations. Editors at leading U.S. daily newspapers seem to realize this. The frequent inclusion of diagrams and illustrations may also relate to environmental articles being written as feature articles in special weekly sections. Some of the articles in the sample were breaking news written on a short deadline. Others, such as those longer than 90 paragraphs, obviously had a longer deadline allowing more time for visual elements to be prepared.

Infrequently included forms of context. The newspapers are not often providing context in the form of references to research, sources for more information, or maps. Maps were found least often but were not absent from environmental articles. Maps may have been included less often than other visual elements of context because for local environmental issues, the readership is familiar with the area. The newspapers in the sample are national newspapers though, and from observation, most of the articles examined did not appear to be local issues. While maps were found less often than any of the other elements, the editors may have special guidelines for including them when appropriate. If not, the infrequent inclusion of them certainly warrants attention and the creation of such guidelines.

The infrequent mention of sources of more information on the issues raises questions. Are these not included because of space constraints or because editors think readers wouldn't be interested? In either case, the lack of sources for more information leaves the readers on their own without any guidance as to where to look to learn more about the issues.

References to additional research also are rare, perhaps indicating that many environmental issues reported in leading U.S. daily newspapers are not based on or about scientific research. This makes some sense, because an environmental article can be about a debate over environmental regulations, in which case other story elements are more pertinent than research. At some level though, most if not all, environmental issues are based on research.

Differences among newspapers. It was not surprising that *USA Today* articles contained diagrams and illustrations more often than the other newspapers, or that it had significantly fewer paragraphs in articles than *The Los Angles Times*. After all, the print version of *USA Today* is known for these traits. Brief articles may also explain why *USA Today* included sources for more information more often than expected; readers are sent to other sources that couldn't be included in the short articles. What was unexpected was that the total context score for *USA Today* articles was higher, although not significantly, than all of the other newspapers and that *USA Today* had more references to the research on which the articles were based. This result can be viewed at least two different ways. First, articles in *USA Today* are more often research-based or second, that the writing in *USA Today* is less enterprising as it is often based on press releases from research institutions without further interpretation. The question of which way to view the findings can't be answered without further research, but from observation of the sample articles the reason for *USA Today* including more references to research appears to be a mix of the two.

Finding that *The New York Times* and *The Washington Post* were more likely than expected to include historical information is not surprising, as they appear to only be including more than *USA Today*. That *The New York Times* includes more photographs with environmental articles than the other newspapers may be due to the special weekly science section of that newspaper where most of the environmental articles were found. The preparation of that special section may allow for more photographs than the other newspapers.

Curiously, articles containing conflict and written in an adversarial frame have a lower amount of context. However, this is likely the reason why *The Washington Post* had a nearly significant lower context score than *USA Today*. *The Washington Post* had a greater percentage of adversarial articles, and its lower overall context score can likely be attributed to that.

Context online vs. print. The drop in the context score as the articles were transferred to the Web was surprising. Also unexpected was that only 5 of the 206 articles appearing online had audio or video and the online versions had significantly fewer photographs and maps. While there were some enhanced interactive diagrams online, only a handful of articles were longer online than their print counterparts. These minor enhancements didn't appear in a large enough quantity to indicate that the context is being enhanced online. It is important to note here that the findings for print articles don't necessarily indicate a significant need for improvement. But the findings do indicate that the potential of the Web is not being put to use to improve the context in environmental articles to any significant extent.

Finding that *The Christian Science Monitor*, *The New York Times*, and *The Washington Post* are the only three adding sources for more information to their online articles in significant proportions also was unexpected,

as adding links to an article is technically simple. Whatever the reason, the editors are passing up an opportunity to give their readers more information in a relatively easy way.

The missed potential for context to be enhanced online might be the result of the economic pressures facing the newspaper industry. Some media outlets have already faced large cutbacks in their online departments (Barringer, & Kuczynski, 2000). Additionally, some editors may be hesitant to devote resources to an unprofitable part of the operation. Finally, the technical limitations also may work against enhancing context. Adding images, audio or video to a Web page decreases the speed at which the page loads. The utility of such advancements is not completely understood, and it could be that the decision-makers at the major newspapers do not see the usefulness of such features as they relate to their print articles.

The speculation about why so little context was found points out the need for research examining the factors shaping print and online environmental content at these leading papers. Surveys or depth interviews with environmental reporters and editors, as well as online editors, would help shed light on these findings.

Conclusion

The leading U.S. daily newspapers are providing some context in their environmental articles, but there is room for improvement. The inclusion of research is lacking. Because scientific research is the foundation of environmental issues, journalists should strive to more often base their reporting on research. Another area where the major newspapers are failing is in referring readers to sources of more information. In the event readers wish to learn more about the issues, they should have some guidance as to where to find such information. This is especially true online, where more information is a simple click away. Giving readers a direct link to more information is a simple way to increase the transmission of information on issues. Furthermore, photographs, maps, and other visual elements should be included in articles transferred to the Web. If these elements are omitted online because of financial concerns, the people making these decisions should consider how they could make money from a product less visually stimulating than their print product. It is only logical that if the major newspapers ever hope to attract a large, profitable audience to their online product, that product is going to have to be at least as complete as the print product, and likely more in-depth and interactive.

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Framing the Environmental Agenda: A Qualitative Comparison of 1970 Nixon Speeches and *Time* Magazine

by

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RUNNING HEAD: ENVIRONMENTAL AGENDA

Framing the Environmental Agenda:
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Nixon Speeches and *Time* Magazine

Abstract

This study compares the rhetorical frames employed by President Richard Nixon and *Time* magazine's reporting in 1970 to gain a better understanding of early mainstream environmental references. The frame Nixon used most often was that of the need for a collective, unified effort to address the nation's environmental problems. By contrast, the frame used most often by *Time* was that of the economy and quality of life versus the environment.

The year 1970 was a watershed for the United States environmental movement. Only the year before, television had afforded the nation views of Ohio's Cuyahoga River literally on fire [1] and close-ups of oil-soaked wildlife in a Santa Barbara, California, marine reserve. [2] These dire consequences of our industrial laissez faire were reinforced by reports of Apollo 13 astronauts, who described seeing smog-enshrouded cities from space. The same moon-landing mission underscored at once the seeming fragility and beauty of the "blue planet," as seen by the world in photographs taken during the voyage.

Indeed, prior to 1970, the nation's environmental policy had been largely limited to managing its natural resources, not regulating industry or controlling pollution. Such issues had been considered "local problems," as President Dwight Eisenhower had called them.[3] But a decade later, Lyndon Johnson's administration did take notice of environmental issues, resulting in water and auto exhaust legislation.[4] Yet it was Richard Nixon's administration that would herald modern environmental regulation at a coordinated federal level.

Nixon signed the National Environmental Policy Act on national television, New Year's Day, 1970, declaring it "the decade of the environment." In addition to encouraging "productive and enjoyable harmony between man and his environment," it mandated environmental impact statements across federal agencies and created the Council on Environmental Quality.[5] Certainly it was an issue that the public, astute politicians, and a savvy Nixon administration all welcomed. In addition to appealing to Americans' common sense, the environment was employed as a cohesive issue in a

nation sorely divided by civil, social, and military unrest. Nixon stated as much in his 1970 State of the Union message:

> The great question of the seventies is, shall we surrender to our surroundings, or shall we make peace with nature and begin to make reparations for the damage we have done to our air, our land and our water? Restoring nature to its natural state is a cause beyond party and beyond factions. It has become a common cause of all the people of America.[6]

These words introduced a year of numerous environmental firsts. It was a large, broad-based general public—children and adults alike—who joined Senator Gaylord Nelson of Wisconsin and a handful of his volunteer organizers to celebrate the first national Earth Day on April 22, when "teach-ins" occurred on college campuses and in communities around the country. It demonstrated, said policy scholars Norman Vig and Michael Kraft, "ecology's new place on the nation's social and political agendas."[7] Federal clean air regulations followed under the Clean Air Act, which for the first time set national standards to which states had to adhere, and the federal Environmental Protection Agency was created in July to integrate the various departments' pollution programs.

Previous research has documented that the "dramatic rise in citizen awareness in 1969 and 1970 made pollution a major news story. An information explosion occurred in the mass media and accompanied the spectacular rise in public concern about the environment."[8] Indeed, *Time* began a separate environment section in its August 1, 1969, issue. The section was introduced in a letter from Publisher James R. Shepley, who wrote, "America the Beautiful can all too often be described as America the Polluted, and anxiety about the quality of life has become a rising political issue."[9] *Time*'s January 4, 1971, issue heralded the environment as the 1970 "issue of the year," and a study of *Newsweek*'s environmental coverage from 1969 to 1975 found the

highest number of environmental articles appeared in 1970 (totaling 57, 26 percent of the study's population).[10]

Therefore, 1970 is a rich year for investigating the origins of the mainstream environmental movement as communicated to the public. This paper explores (1) how President Nixon framed the environmental issue in 1970 speeches and (2) how *Time* framed it. It also explores whether the environmental movement was marginalized or otherwise dismissed or not taken seriously via the frames invoked. Specifically, this paper examines the words Nixon used to define issues of the environment and those that *Time* used in setting the context of the problem, defining the issues to be addressed, and providing the tools—or concepts—by which the public might come to understand them. Specifically, this study aims to expand the knowledge of early federal environmental rhetoric and concurrent mainstream media coverage to help scholars better understand resultant public opinion, political expectations, and social action. These rhetorical frames are important to document for they do not occur in a vacuum; rather, they make up the rationales, reasons, and parameters of public understanding and debate about issues.

Literature Review

Bruce Williams and Albert Matheny contend that "events like the first Earth Day in 1970 marked the emergence of environmentalism as a powerful social movement," and Douglas Torgerson wrote: "Upon entering the public scene, environmentalism disturbed the established discourse of advanced industrial society."[11] Scholar M. C. McGee offered a rhetorical theory of social movements that Kevin DeLuca describes as "an account of the social consciousness of a society."[12] DeLuca continues by saying,

"social movements are changes in the meanings of the world, redefinitions of reality, with such realities always being constructed through the filter of rhetoric."[13]

As early as 1922, Walter Lippmann wrote of the media's power to illuminate issues for the public, as if a spotlight were temporarily focused on them, bringing them into view.[14] Issues that presidents espouse are even more likely to be illuminated. Says scholar John Kingdon: "The [presidential] administration . . . is a powerful agenda setter. When a president and his top appointees decide to place a high-priority on a given item, agendas are set all over town. Members of Congress, bureaucrats, and lobbyists all pay attention to that priority item."[15] Communication scholar Bernard Cohen also discusses the symbiotic relationship of the government and press, saying that the government's publicity efforts result in media coverage, which is then interpreted by other officials as public opinion.[16] Presidents are in the position to "raise issues to the public's attention, define the terms of public debate, and rally public opinion and constituency support through speeches, press conferences, and other media events," say Vig and Kraft. "Without presidential endorsement, major policy initiatives have rarely been successful."[17]

Similarly, presidents use the press not only to influence opinion, but also to observe the press's reaction as an indicator of what the public might think. An aide to President Carter called the press a useful "litmus test" for indirectly gauging the public's reaction to proposed public policy.[18]

A study by Jeffrey Cohen revealed presidents played an active role in civil rights policy development, influencing public opinion and setting the agenda on that issue rather than reacting to the public's agendas.[19] He concluded that it was the discretionary nature of the issue, as opposed to pressing economic and foreign relations issues, that

allowed presidents considerable influence in getting public attention and support. Although environmental problems were becoming highly visible to many Americans—if not directly, then through the mass media—it certainly was not as urgent an issue as many others were in 1970, such as the Vietnam War.

In addition to the president setting the media agenda, the media, too, have been found to set the agenda for both the president and the public. In a series of four studies, Wayne Wanta et al. found that the direction of agenda setting indeed flowed two ways. Their research suggested that in 1970, President Nixon influenced the press agenda overall. One researcher has noted, "Much of people's awareness about the environment and environmental issues may come not from direct experience but from media attention to the subject. The issue is unobtrusive, and therefore more susceptible to mass media influence."[20]

Indeed, several studies have found media agenda-setting effects for environmental issues. Pollution, toxic waste, environmental protection, and energy supply are among those issues for which effects were found.[21] More recent work has drawn on the concept that McCombs et al. have called agenda-setting level two, or the attributes—or frames—of a message. [22] This concept implies that the way in which a message is structured conveys not only what to think about, but also how to think about it, including the saliency it invokes. [23]

William Gamson wrote that facts evoke meaning only in that they are "embedded in a frame or story line that organizes them and gives them coherence, selecting certain ones to emphasize while ignoring others."[24] Political scholar Murray Edelman describes framing as a construction of perceived social realities.[25] Political scholar Thomas Nelson et al. put forth a similar definition, referring to framing as "the process by which a

communication source, such as a news organization, defines and constructs a political issue or public controversy. By framing social and political issues in specific ways, news organizations declare the underlying causes and likely consequences of a problem and establish criteria for evaluating potential remedies for the problem."[26] Communication scholar Dietram Scheufele expounded upon the framing literature, noting, "It is rather likely that this frame-building function of mass media has a greater impact for relatively new issues (i.e., issues for which no frames have yet to be established [in the public's mind])."[27]

In 1970, the environment as a political issue was no doubt new to many Americans. But, as a 1990 German study illustrated, the amount and type of coverage could well have had an effect on the movement. The German national election study indicated that the framing of an issue—in addition to frequent coverage—influenced overall salience toward that issue.[28] Scholar Alison Anderson notes, "Studies of environmental news coverage in a variety of countries have found that official sources (particularly government departments and scientists) tend to enjoy advantaged access to the media and become 'primary definers' of the issue in question."[29]

Methods

Nixon speeches were obtained from the *Public Papers of the Presidents* and were identified through the book's index under the heading "environment." There were 35 1970 speeches identified in which the president spoke about the environment. (A complete list of speeches reviewed is included in Appendix A.)

The table of contents in each of *Time's* 1970 issues was examined. Of the 52 issues, 41 had an environment section. One issue's section pages were missing;

therefore, 40 issues were reviewed and analyzed. Advertisements, photographs, and articles outside the environment section were not included in this study. *Time* was selected for this study because it was the oldest and most widely circulated newsmagazine of the day, along with its national circulation, emphasis on the issue, and its general reputation for being rather conservative in tone. Its reporting, then, could be considered mainstream discourse of the day. (See Appendix B for a complete list of the magazine issues reviewed.)

Frames were noted and categorized according to the rhetorical frames identified by researchers Catherine Collins and Susan Kephart in their environmental framing study of biodiversity. [30] These same frames were selected for this study because they emerged from Collins and Kephart's textual analysis about a broad environmental topic and because the author found these frames useful in a prior study about an environmental issue. [31] Collins and Kephart's frames and definitions appear below, with their adaptations for this study indicated in brackets: 1) ecosystems [environment] as *unique treasures* [that should be saved for *future generations*] (emphasis on pristine and unique aspects; culturally or otherwise valuable; irreproducible state of Eden), 2) biodiversity [environment] as *political football* (a candidate's [official's] position becomes an electoral asset or liability), 3) *economy vs. environment* (incompatible agendas; environmental protection yields economic ruin or threatens quality of life), 4) *race against the clock* (species becoming extinct; urgency), and 5) No progress due to *political wrangling* (decisions on environmental legislation not based on scientific or moral grounds; they are restricted by partisan political maneuvering).

In addition, because some consider the rise of environmentalism to be a social movement, frames identified by Todd Gitlin in his study of the major media's framing of

the "New Left" in the 1960s also were used.[32] The frames Gitlin identified included those that served to trivialize the movement, demonstrate polarization of views, emphasize dissension within the movement, and marginalize the movement.

Frames that did not fit any of these classifications but nonetheless emerged in the study were also noted. These included the following: complicated, interrelatedness of issue; naïve optimism; "new" way of thinking; individual and collective responsibility, unifying issue; international issue; science will save us. To add additional context to the study, results of 1970 Gallup polls that addressed issues of the environment also were consulted to determine the public's opinion during this time.

Findings

Tables 1 and 2 below relay the framing categories and frequencies with which they occurred, in descending order of occurrence.[33]

Table 1. Nixon Frames and their Frequencies

Frame	*Number of Times Used*
individual and collective responsibility/unifying issue	16
apocalyptic, race against the clock, urgency	13
"new" way of thinking	11
unique treasures, future generations	9
complicated, interrelatedness of issue	8
international issue	7
economy v. environment	6
political credit/football	6
naïve optimism	5
science will save us	5
marginalization/radicalism	---
political wrangling	---

Table 2. *Time* Frames and their Frequencies

Frame	*Number of Times Used*
economy v. environment	43
apocalyptic, race against the clock, urgency	28
"new" way of thinking	24
complicated, interrelatedness of issue	16
marginalization/radicalism	12
political credit/football	9
political wrangling	7
international issue	7
individual and collective responsibility/unifying issue	6
unique treasures, future generations	1
science will save us	1
naïve optimism	---

The frame of individual and collective responsibility/unifying language was the most prevalent among Nixon's speeches and appeared most heavily earlier in the year, but appeared consistently through the end of August. (See Figure 1.) This finding corroborates suspicions of a political strategy to help unify a divided nation (or, as some critics claimed, divert attention from the divisive issues of war and civil rights). An example of this frame appears in Nixon's February 6 speech in Chicago. He said, "In order to deal with this problem, it is going to require total mobilization. ... the total mobilization of the Nation, the mobilization of the Federal Government, the State governments, the local governments, of industrial producers, and also of the individual citizens."

The second most commonly used frame by Nixon was that of the problem's urgency. This theme began with his January 1 statements, in which he made several references to the issue being so serious as to be addressed "now or never." Again, this frame appeared most frequently in the early part of 1970, as he apparently tried to impress upon the public the dire state of environmental matters. Certainly these sorts of

Figure 1. Number and Types of Environmental Frames Used by Nixon in 1970 Speeches, by month

Frames	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
individual, collective responsibility, unifying issue	x	xxxxxxxx		x			x	xxxx		x			13
apocalyptic, race against the clock, urgency	xxxx	xxxx		x			x	xxxxxxxx		xxx			11
"new" way of thinking		xx						xxx			x		9
unique treasures, future generations	x	xx					x	xxxxx		x			8
complicated, interrelatedness of issue	x		x			x	xx	xxx	xx				6
economy v. environment		xxx					x			x		xxx	7
international issue	xxx	x											5
naïve optimism	x	x		x				x					6
political credit/football	x	xx											0
science will save us													0
marginalization/radicalism													
political wrangling													

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emotional appeals could help increase the saliency of the issue in the public's mind and thus help set the political agenda on this issue.

The third most common frame found in Nixon's speeches was a focus on a "new" way of thinking and acting in our society. This again placed the responsibility on the society at large as well as on individual citizens, scientists, and industrialists to change the previous societal mindset of consumption without consequences and inexhaustible resources. His August 10 message to Congress included the following: "We need new knowledge, new perceptions, new attitudes. . . . We must seek nothing less than a basic reform in the way our society looks at problems and makes decisions."

By comparison, Nixon did not raise the economy v. environment frames very often, and when he did, it was mainly to refute the perceived dichotomy. For example, in his February 25 speech at the National Governors' Conference he said, "One reaction is that there is an irreconcilable conflict between economic growth and happiness or economic growth and a decent life in this country. It just doesn't happen to be true." This stance makes sense, for Nixon's purpose, it seems, was to emphasize the collective, unifying aspects of the problem—not the oppositional ones.

In contrast, *Time*'s frames overwhelmingly reflect their oppositional nature. (See Figure 2.) For example, the February 2 issue said, "The result of massive production is massive filth." *Time* used this frame throughout the year, but it appeared most heavily in July. Nixon referred to the dichotomy most often in August, again trying to negate it. Just as in Nixon's speeches, the second most common theme in *Time* was the race against the clock or urgency frame. Twice in this study, the magazine specifically picked up on this frame from the president's speeches, by referring to and quoting from them, and in one case, editorialized by saying: "Nixon's words come none too early."

Figure 2. Number and Types of Environmental Frames Used by *Time* in 1970, by month

Frames	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
individual, collective responsibility, unifying issue		xxx			xx							x	6
apocalyptic, race against the clock, urgency	xx	xxxx		xx	xxx	xx	xxxxxx	xxxx	x		xx	xx	28
"new" way of thinking		xxxxx		xx	xxx	xx	xxxx	x	x	xx	x	xxx	24
unique treasures, future generations											x		1
complicated, interrelatedness of issue	x	xxxxx	xx		xx	xx	x		x	x	x		16
economy v. environment	xx	xxxxxxx		x	xxxx	xxxx	xxxxxxxxxxx	xx		xxx	xxxxxx	xx	43
international issue		x					x			x	xxx	x	7
naïve optimism													0
political credit/football	x	xxx		x	x	x		xx					9
science will save us		x											1
marginalization/radicalism	x	xxx	x	x	xxx	x	x			x			12
political wrangling		x		xx	xx	xx							7

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Another common environmental frame in *Time*'s 1970 coverage was the complicated, interrelatedness of the environmental issue. It included the recognition that solutions could not be simple and would not be easy through statements such as the following, which appeared in the May 25 issue: "Ecologists know that removal of even one element, like leaves, will touch off a chain of related changes—all of them probably for the worse."

As shown in figures 1 and 2, there is also evidence of a shift in frames during the year. Early in 1970, Nixon seemed to emphasize the urgency of the nation's environmental state and the collective, unifying nature of the problem and solution. These two themes again appeared in August. The naïveté shown in the first half of 1970 through such statements as the following, which he voiced February 10, "The lives ... in the future, motorist and pedestrian, are going to be pollution-free," disappeared after July. Similarly, the science-will-save-us frame also was most heavily emphasized early in the year, but declined by August, when the complicated nature of the problem began to be discussed. Likewise, the emphasis on new outlooks and approaches toward the environment was most heavily emphasized during August as well.

The more emotional unique treasures/future generations frame was used by Nixon when he was campaigning for fellow Republican candidates in October. In contrast, the international frame was fairly consistent throughout, and as might be expected, the political football frame appeared most heavily at the end of the year, when Nixon expressed how governmental efforts take time and predicted 1971 to be the "year of action" regarding environmental regulation.

Time gave comparatively little emphasis on the collective responsibility or unifying issue of the environment, using this frame most often (three times) in February,

perhaps picking up on the heavy emphasis Nixon placed on it during that month. *Time* did, however, include references to the urgency of the situation, the need for "new" thinking and approaches, and the economy v. environment frame throughout the year. Therefore, it is possible that Nixon's relatively later emphasis on these issues could have been spurred by the media's framing.

Other differences between Nixon's and *Time*'s framing included the virtual absence of the "unique treasure" frame in the magazine, perhaps because such emotionally laden rhetoric naturally fits more readily into political speech than news coverage. There also seemed to be a more realistic sense of the nation's environmental problems in *Time*, as evidenced by the absence of the naïve optimism frame and only a single occurrence of the science-will-save-us frame. Technology topics were included in *Time*, and there were indications that these innovations would help the nation address its problems, but science was not considered a panacea.

Time focused more on the political wrangling involved in addressing environmental issues in the first half of the year and also included frames that denoted some marginalization and radicalism during that time period as well, perhaps because of a perceived threat to the status quo. Although few examples of Gitlin's social movement frames were found in this study, those that were found focused primarily on the marginalization of young "radicals" and the trivialization of some Earth Day coverage. For example, the May 5 issue of *Time* described the celebration thusly: "Much of the day was given to theater and ritual. At the University of Wisconsin, 58 separate programs were staged, including a dawn 'earth service' of Sanskrit incantation. Some students at Florida Technological University held a trial to condemn a Chevrolet for poisoning the air." In his study of *Newsweek*, Babcock also found a rather dismissive tone to that

newsmagazine's 1970 Earth Day coverage as well as a relatively short-lived attention span regarding the environment over the next five years.[34]

Still, Gitlin's frames did not emerge as dominant themes in *Time* and did not appear in Nixon's rhetoric at all. This latter point makes sense, as the president was trying to convey a sense of importance to the nation as a whole and thus made attempts to emphasize the environment as an issue that required effort from every individual as well as from the collective nation. At times, the magazine even seemed to position the mainstream environmental movement as separate and distinct from the "radicals." The April 27 *Time* included the following: "Unless young radicals stir up trouble, which is always possible these days, the emphasis will be mainly on education."

Both Nixon and *Time* emphasized the environment as a new cause for the young. For example, in its March 16 issue, *Time* proclaimed, "The environment has become the number one issue on campus." However, this was not the case in January, when Gallup polled college students and, although the polling company heralded "air and water pollution, quality of education—new 'causes' on campus" in a report headline, the results actually showed "control of air and water pollution" to be sixth on the list of domestic changes sought, behind poverty, race relations, urban problems, education, and welfare issues.[35]

A February poll representing all U.S. adults found that air and water pollution was eighth on the list of the nation's most important problems.[36] Public policy scholars argue that an increasingly affluent and well-educated society was placing new emphases on their quality of life during this time, but no doubt other, more pressing and vitriolic issues also were brewing in 1970.

Still, one might argue that agenda-setting evidence appears in the June Gallup poll, after the prevalent mass media coverage of Earth Day. That month, reducing air and water pollution came in second—just three percentage points behind reducing crime—as one of the problems that the public would like to see the government devote most of its attention to in the coming year.[37] Although the issue remained high on the list of U.S. and other world leaders' urgent problems in the following month's polls, (ranking third and fifth among the leaders, respectively), the U.S. public did not include pollution among the nation's top nine most important problems.[38] Perhaps the public believed that now that the government was involved, environmental problems were being sufficiently addressed.

By October, pollution was not listed among the top five most important problems, but it was not totally off the public agenda. In November, a poll found the majority of Americans expressed a willingness to pay an extra $100 per automobile if it had anti-pollution devices installed, and 58 percent of Americans said that pollution would be "extremely important" in their voting decisions regarding Congressional candidates.[39]

Despite the increase in environmental coverage in 1970, it apparently still was not high on the list of reporters' issues either, at least as far as the president's news conferences were concerned. After the president's New Year's Day announcement that the 1970s would be the "decade of the environment" and his emphasis on the environment in his State of the Union address, there were no questions about this issue at the next press conference January 30.[40] Nor were there questions about the creation of the U.S. Environmental Protection Agency at the July 20 press conference.[41] At the December 10 conference, only the funding of the Super Sonic Transport (SST) jet was

raised, which had been previously explored in *Time* in terms of the jet's potential contribution to noise pollution. Even the press's questions about the firing of Secretary of the Interior Harry Hickel late in the year centered not on Hickel's environmental stances, but on how much "dissension" was tolerated within the administration.[42]

Perhaps this seeming lack of media attention following Nixon's early January focus on the environment spurred the president to praise the press who were covering this topic. Remarks following a meeting of the Cabinet Committee on the Environment and the Council on Environmental Quality in Chicago, Illinois, February 6, included the following:

> "I finally would like to say that I want to congratulate the members of the press in the Chicago area. I noted, for example, the articles that have been appearing in the *Chicago Tribune* in this field, and the fact that the *Tribune* named an environmental editor. I know that the other papers in the area, the *Sun Times*, the *Daily News*, and others as well, that they have showed very great interest, and that the television stations and others have indicated an interest in this problem."

Overall, *Time* mentioned President Nixon specifically in terms of his environmental policies and speeches a dozen times in 1970. Although there was evidence of similar framing of the environmental issue, it was not overwhelming and possibly could have gone both ways, as Wanta et al.'s research showed, with the president leading the press agenda at times, and the press influencing the president's at other times. Indeed, Wanta and Foote's broadcasting study found evidence that for social issues, such as crime and the environment, the president may use the media to help determine the issue's importance.[43]

However, this study's results can only conclusively point to the diversity of the environmental issue itself. As *Time* Publisher Shepley wrote in the issue announcing the environment section: "Environment will describe the exciting ideas of architects, city

planners, ecologists, engineers, politicians and plain people. These ideas will include, among many others, dispersing glutted populations, building new experimental cities, designing steam and electric autos, restructuring mass transit, recycling all kinds of waste—and in general making this world a more livable place."[44]

Indeed, *Time*'s definition of the environment was as broad as the "new science" of ecology. The topics included in 1970 ranged from the problem of dog feces in cities and electrical "brown-outs" to overpopulation and the wealth beneath the sea. Other topics included wildlife, noise, visual aesthetics, urban and land-use planning, suburban sprawl, technology, air and water pollution, timbering, farm runoff, billboards, the Vietnam War chemical defoliant "Agent Orange," legal issues, and off-road/all-terrain vehicles. In this regard, the coverage was atypical of contemporary studies that have found news media to typically embrace an episodic, rather than thematic, frame.[45]

Time's use of a broad range of sources also is impressive. The magazine profiled and quoted professionals in myriad fields, including law, education, science, conservation, trappers, industrialists, and government officials. While much research has shown that environmental journalism stories predominantly use government sources, this was not the case in *Time*'s 1970 coverage.[46] This makes sense in that there were not many official government sources on the topic at that time; therefore, *Time* sought out and used other types of sources. Such diversity also supports the environmental complexity frame found throughout much of *Time*'s text.

In retrospect, the overall scarcity of Gitlin's social movement frames also is not surprising. After all, an issue taken up by the president and included as a regular section in a mainstream publication does not reflect an issue at odds with society. However, once the framing analysis was under way, there was clearly evidence of all four of

Robert Entman's framing functions (defining the situation, diagnosing causes, making moral judgments, and offering remedies).[47] Occasionally, *Time* writers blatantly provided editorial comments, demonstrating the saliency of the issue, at least to that particular writer. The issue of "advocacy" versus "objective" reporting remains a contentious issue among environmental reporters today.

Still, the most common *Time* frame by far was a generally adversarial one, pitting the economy and quality of life against environmental concerns. Although conflict is an entrenched news value, a 1997 study by Michael Karlberg argued that such framing actually harms the environmental movement by limiting public understanding.[48] Karlberg's recommendations include employing a diversity of perspectives and a nonconfrontational tone to help further environmental causes. With few exceptions (e.g., the marginalization/radicalism frames), *Time* did a good job of incorporating diverse perspectives, even within its use of the environment v. economy frame. The prevalence of the race-against-the-clock frame from both sources mirrors the findings of Collins' and Kephart's study, for that frame was used most often in their study of news about biodiversity.

Other findings of this study included not only the recognition that a new way of thinking about the environment and society's consumptive habits was needed, but also the emergence of individual citizens as environmental stakeholders. In contrast to the interpretation of Robert Gottlieb, who found the media coverage of that era to define solutions in terms of individual behavior rather than societal change, I found that solutions were defined in both areas.[49] For example, in an August 8 speech, Nixon said: "The job of building a better environment is not one for government alone. It must engage the enthusiasm and commitment of our entire society. Similarly, the active

participation of the business community is essential." In addition, both the dire and optimistic predictions concerning the year 2000 also were fascinating—especially from this vantage point in history—and included warnings of oil depletion, starvation, the extinction of all mammals, and the optimistic belief that poverty would be eliminated in our cities.

Limitations and Discussion

Limitations of this study include the subjective nature of frame interpretation, the analysis of only one news medium, and the short time period studied. Additionally, several of the dozen frames employed in this study could be interpreted as overlapping, such as the two political frames, the naïve optimism and science will save us frames, and the collective responsibility, interrelatedness of the issue, and "new" way of thinking frames.[50] Although more general, mutually exclusive frames could make coding easier and more uniform, some of the description of more specific frames could be compromised. Still, it is interesting to note that three of the five categories Downs identified as part of social "issue attention cycles" could be identified in this study. Those middle three categories included "alarmed discovery and euphoric enthusiasm," "realizing the cost of significant progress," and "gradual decline of intense public interest." (The other two categories were "pre-problem" and "post-problem.")[51]

Through its more detailed frames, this study provides a snapshot of mainstream environmental rhetoric used in the early days of the environmental movement, which could be argued helped set the tone for future public understanding and debate. This study also demonstrates some of the similarities (e.g., conflictual frames) and contrasts

(e.g., diverse sources) between early environmental journalism and more contemporary conventions.

Future research might explore and compare environmental frames used by presidents Nixon through Clinton, both the alternative and mainstream environmental press coverage of each administration, and the concurrent public opinion polls and Congressional action. Such documentation could help scholars gauge the patterns of national environmental rhetoric, interest, and action during the past 30 years.

In addition, the frames used and frame patterns identified in this study might also be applied to other public policy issues relating to science. For example, if one examined the national discourse about terrorism and bioterrorism, one might find naïve optimism in the days and weeks following September 11 and/or calls for the nation to unite in the effort. News pieces might start covering the topic in a broad way, speaking with lots of different sources, until the government—from the federal level to the state, county, and local levels—became organized to address these issues, at which time the use of government sources might prevail. And perhaps there looms the "economy vs. the war on terror" debate, which might pit the costs of government activities against their impacts on the travel and tourism industries and national social programs. As the war drags on, we are likely to see the political wrangling and "political football" rhetoric employed by Congress and the G.O.P., especially if results are perceived by the public as lagging.

Knowing the tendencies of administrations, journalists, and the public when new initiatives are undertaken could help communicators both anticipate and guard against ineffectual and unrealistic textual frames that stymie, rather than stimulate, public understanding and debate.

ENDNOTES

[1] Oil and debris combined to create a fire in Cleveland, Ohio's, Cuyahoga River in 1969. In Craig Waddell, "Saving the Great Lakes: Public Participation in Environmental Policy," Carl G. Herndl and Stuart C. Brown (eds.), *Green Culture: Environmental Rhetoric in Contemporary America* (Madison: University of Wisconsin Press, 1996), 145.

[2] President Lyndon Johnson had leased the federal area to oil companies in lieu of raising taxes to help finance the Vietnam War.

[3] Richard N.L. Andrews, *Managing the Environment, Managing Ourselves: A History of American Environmental Policy* (New Haven, CT: Yale University Press, 1999), 227.

[4] Bruce J. Schulman, *Lyndon B. Johnson and American Liberalism: A Brief Biography with Documents* (Boston: Bedford Books, 1995), 92.

[5] Andrews, *Managing the Environment*, 226.

[6] Andrews, *Managing the Environment*, 227.

[7] Norman J. Vig and Michael E. Kraft, eds., "Environmental Policy from the 1970s to 2000: An Overview" in *Environmental Policy*, 4th ed. (Washington, DC: CQ Press, 2000), 11.

[8] James S. Bowman and Kathryn Hanaford, "Mass Media and the Environment Since Earth Day," *Journalism Quarterly* (Spring 1977): 160.

[9] According to Herbert Gans, the magazine initially planned to start a city section, but was beaten to it by *Newsweek*; therefore, an environment section was started instead (in Herbert J. Gans, *Deciding What's News: A Study of CBS Evening News, NBC Nightly News, Newsweek, and Time.* (New York: Vintage Books, 1980), 166.

[10] *Time*, 4 January 1971, 21-22; William A. Babcock, "Environmental Pollution Coverage in *Newsweek* from 1969 through 1975," Southern Illinois University, unpublished Ph.D. dissertation, 1980.

[11] Bruce A. William and Albert R. Matheny, *Democracy, Dialogue, and Environmental Disputes: The Contested Languages of Social Regulation* (New Haven, CT: Yale University Press, 1995), 28; Douglas Torgerson, *The Promise of Green Politics: Environmentalism and the Public Sphere* (Durham, NC: Duke University Press, 1999).

[12] M. C. McGee, "In search of 'the people': A rhetorical alternative" in *Quarterly Journal of Speech*, quoted in Deluca, Kevin Michael, *Image Politics: The New Rhetoric of Environmental Activism* (New York: Guilford Press, 1999). Although scholars differ in their definitions of social movements per se, if we apply the *Webster's New World College Dictionary* (New York: Macmillan, 1997) definition of "movement," it is clear that environmentalism fits the criteria. For example, some of the Webster's definitions include "a) a series of organized activities by people working concertedly toward some goal b) the organization consisting of those active in this way c) a tendency or trend in some particular sphere of activity."

[13] Kevin Michael Deluca, *Image Politics: The New Rhetoric of Environmental Activism* (New York: Guilford Press, 1999), 36.

[14] Water Lippmann, *Public Opinion* (New York: Macmillian, 1922).

[15] John W. Kingdon, *Agendas, Alternatives, and Public Policies* (2nd ed.) (New York: HarperCollins, 1995), 69.

[16] *Ibid.*

[17] Norman J. Vig, "Presidential Leadership and the Environment: From Reagan to Clinton" in *Environmental Policy*, 99.

[18] Attributed to Stuart Eizenstat in *Ibid.*

[19] Jeffrey E. Cohen, "The Dynamics and Interactions Between the President's and the Public's Civil Rights Agendas: A Study in Presidential Leadership and Representation," *Policy Studies Journal* 21 (Autumn 1993): 514-522.

[20] Harold G. Zucker, "The Variable Nature of News Media Influence," quoted in Joe Bob Hester and William J. Gonzenbach, "The Environment: TV News, Real-World Cues, and Public Opinion over Time," *Mass Comm Review* 22 (1995): 10.

[21] See Tony Atwater, Michael Salwen, and Ronald Anderson, "Media Agenda-Setting with Environmental Issues," *Journalism Quarterly* 49: 393-397; Shanto Iyengar and Donald Kinder, *News that Matters: Television and American Opinion* (Chicago: University of Chicago Press, 1987); Hans-Bernd Brosius and Hans Mathias Kepplinger, "The Agenda-Setting Function of Television News: Static and Dynamic Views," *Communication Research* 17: 183-211 for agenda-setting effects, and David Protess, Fay Cook, Thomas Curtin, Margaret Gordon et al, "The Impact of Investigative Reporting on Public Opinion and Policy-Making: Targeting Toxic Waste," *Public Opinion Quarterly* 51, no. 2: 166-185.

[22] M. McCombs, J.P. Llamas, E. Lopez-Escobar, and F. Rey, "Candidate Images in Spanish Elections: Second-Level Agenda-Setting Effects," *Journalism & Mass Communication Quarterly* 74 (1997): 703-717.

[23] For early framing research, see Erving Goffman, *Frame Analysis: An Essay on the Organization of Experience* (Boston: Northeastern University Press, 1974), and Gay Tuchman, *Managing News: A Case Study in the Construction of Reality* (New York: The Free Press, 1978), 1.

[24] William Gamson, "News as Framing," *American Behavioral Scientist* 35: 157-161.

[25] Murray Edelman, "Contestable Categories and Public Opinion," *Political Communication* 10: 231-242.

[26] Thomas Nelson, Rosalee Clawson and Zoe Oxley, "Media Framing of a Civil Liberties Conflict and Its Effect on Tolerance," *American Political Science Review* 91 (September 1997): 567-568.

[27] Dietram Scheufele, "Framing as a Theory of Media Effects," *Journal of Communication* 49 (Winter 1999): 116.

[28] See H.A. Semetkko and A. Mandelli, "Setting the Agenda for Cross-National Research: Bringing Values into the Concept." In M. McCombs, D. L. Shaw and D. Weaver, eds., *Communication and Democracy* (Mahwah, NJ: Lawrence Erlbaum Associates, 1997).

[29] Alison Anderson, *Media, Culture and the Environment.* (New Brunswick, NJ: Rutgers University Press, 1997), 135.

[30] Catherine A. Collins and Susan R. Kephart, "Science as news: The emergence and framing of biodiversity," *Mass Comm Review* 22 (1995): 21-46.

[31] The issue was mountaintop removal, a coal mining method.

[32] Todd Gitlin, *The Whole World Is Watching* (Berkeley: University of California Press, 1980).

[33] An inherent problem with this method was that the frames were not always mutually exclusive: sometimes the same text could fit more than one category. (For example, a single sentence might refer both to the economy v. environment in an international context.) In these cases, the predominant frame was selected. The complete list of textual frames as categorized from the text is available by contacting the author.

[34] William Babcock, "Environmental Pollution Coverage in Newsweek from 1969 through 1975," 115. Said Babcock, "This newsmagazine viewed environmental pollution basically as a rather short-term 'springtime skipalong.'"

[35] *Gallup Opinion Index*, Report No. 55 (January 1970). Providence, NJ, 20, 24.

[36] *Gallup Opinion Index*, Report No. 56 (February 1970). Providence, NJ, 5.

[37] *Gallup Opinion Index*, Report No. 60 (June 1970). Providence, NJ, 8.

[38] *Gallup Opinion Index*, Report No. 61 (July 1970). Providence, NJ, 14, 13, 3, respectively.

[39] *Gallup Opinion Index*, Report No. 65 (November 1970). Providence, NJ, 5, 27, respectively.

[40] "The President's News Conference of January 30, 1970," *Public Papers of the Presidents of the United States. Richard Nixon, 1970.* (Washington, DC: U.S. Government Printing Office, 1971).

[41] "The President's News Conference of July 20, 1970," *Ibid.*

[42] "The President's News Conference of December 10, 1970, *Ibid.*

[43] Wayne Wanta and Joe Foote, "The President-News Media Relationship," 437.

[44] "A letter from the Publisher," *Time*, 1 August, 1969, 3.

[45] See Shanto Iyengar, *Is Anyone Responsible?* (Chicago: University of Chicago Press, 1991).

[46] For more information about government sources, see M. Mark Miller and Bonnie Parnell Riechert, "Interest Group Strategies and Journalistic Norm: News Media Framing of Environmental Issues" in S. Allan, B. Adam and C. Carter, eds., *Environmental Risks and the Media* (New York: Routledge, 2000), 51.

[47] Robert M. Entman, "Framing: Toward Clarification of a Fractured Paradigm." *Journal of Communication* 43 (1993): 52.

[48] Michael Karlberg, "News and Conflicts: How Adversarial News Frames Limit Public Understanding of Environmental Issues," *Alternatives Journal* 23 (1997): 22-28. These frames arise through language that discounts or dismisses the issues as not being serious; uses government sources and statements frequently as evidence of the mainstream versus oppositional views on the matter; focuses on internal conflicts among those involved in the

movement; and discounts those involved and what they say as radical, extreme, or on the fringes of society.

[49] Robert Gottlieb, "An Odd Assortment of Allies: American Environmentalism in the 1990s" in Craig L. LaMay and Everette E. Dennis, eds., *Media and the Environment* (Washington, DC: Island Press, 1991), 47.

[50] This ambiguity became evident when a colleague categorized 20 percent of the speeches and columns, selected at random, and after minimal instruction, achieved only 40 percent agreement with the author.

[51] Downs' first and fifth stages are "pre-problem" and "post-problem." From A. Downs, "Up and down with ecology—the 'issue attention cycle,'" *Public Interest* 28 (1972), 38-50.

Appendix A
1970 Nixon speeches reviewed

1. Remarks on Signing the National Environmental Policy Act of 1969, January 1
2. Statement about the National Environmental Policy Act of 1969, January 1
3. Annual Message to the Congress on the State of the Union, January 22
4. Remarks Announcing Nominees to the Council on Environmental Quality, January 29
5. Statement about the Council on Environmental Quality, January 29
6. Statement on Signing an Executive Order for the Control of Air and Water Pollution at Federal Facilities, February 4
7. Remarks on Receiving the Boy Scouts' Annual Report to the Nation, February 5
8. Remarks Prior to an Inspection Tour of the Hanover Sewage Treatment Facility, February 6
9. Remarks Following a Meeting of the Cabinet Committee on the Environment and the Council on Environmental Quality in Chicago, Illinois, February 6
10. Remarks on Transmitting a Special Message to the Congress on Environmental Quality, February 10
11. Special Message to the Congress on Environmental Quality, February 10
12. Remarks on Presenting the National Medal of Science, February 16
13. First Annual Report to the Congress on United States Foreign Policy for the 1970's, February 18
14. Remarks at the National Governors' Conference Winter Session, February 25*
15. Statement on Establishing the National Industrial Pollution Control Council, April 9
16. Special Message to the Congress about Waste Disposal, April 15*
17. Special Message to the Congress Urging Legislation To Avoid Further Pollution in the Santa Barbara Channel, June 11
18. Special Message to the Congress about Reorganization Plans To Establish the Environmental Protection Agency and the National oceanic and Atmospheric Administration, July 9
19. Message to the Congress Transmitting Reorganization Plan 3 of 1970: Environmental Protection Agency, July 9
20. Remarks of Welcome to President Urho Kekkonen of the Republic of Finland, July 23
21. The President's News Conference of July 30
22. Message to the Congress Transmitting the Annual Report on the National Wilderness Preservation System, August 5
23. Message to the Congress Transmitting the First Annual Report of the Council on Environmental Quality, August 10
24. Remarks on Inscribing a Copy of the Report of the Council on Environmental Quality for the Council Staff, August 10*
25. Statement in Support of Republican Candidates in Wisconsin, October 17
26. Remarks in Kansas City, Missouri, October 19
27. Remarks at East Tennessee State University, October 20
28. Statement in Support of Republican Candidates in North Carolina, October 20
29. Remarks in Fort Wayne, Indiana, October 20
30. Remarks in St. Petersburg, Florida, October 28
31. Remarks at Longview, Texas, October 28*
32. Remarks at the Swearing In of William D. Ruckelshaus as Administrator of the Environmental Protection Agency, December 4

33. The President's News Conference of December 10
34. Statement on Signing Executive Order Establishing a Water Quality Enforcement Program,
December 23
35. Remarks on Signing the Clean Air Amendments of 1970, December 31

* No mentions of the environment in the president's public statements in March, May, September, or November.

Appendix B

1970 Time issues in which the Environment Section appeared

January 5
January 12
January 19
January 26
February 2
February 9
February 16
February 23
March 16 (no section in either March 2 or 9 issues)
March 23 (no March 30 section)
April 6
April 13 (no April 20 section)
April 27
May 4
May 11
May 18
May 25
June 1
June 8
June 15
June 22 (no June 29 section)
July 6
July 13
July 20
July 27
(August 3 environmental section pages missing)
August 10 (no August 17 section)
August 24
August 31 (no September 7 section)
September 14 (no September 21 section)
September 28
October 5
October 12
October 19 (no October 26 section)
November 2
November 9 (no November 16 section)
November 23
November 30 (no December 7 section)
December 14
December 21
December 28

SOURCE CREDIBILITY AND GLOBAL WARMING: A CONTENT ANALYSIS OF ENVIRONMENTAL GROUPS

by

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ABSTRACT

The purpose of this study was to determine how environmental journalists rate the credibility of environmental groups as sources of information on the global warming debate. A self-administered survey questionnaire, based on the Meyer's Credibility Index, and a quantitative content analysis, was used to test the credibility and coverage of environmental groups involved in the global warming debate over the last two years.

Environmental interest groups have been sounding the warning bells for more than 30 years about the potentially devastating effects of global warming. From ozone depletion to the melting of the polar ice caps to irreversible climatic changes, interest groups compete to have their positions and warnings covered by the media. One group warns that the hole in the ozone layer will cause a catastrophic increase in skin cancer rates. Another group claims that the increase in the average temperature will cause an increase in the melting rate of the polar ice cap causing the oceans levels to rise, thereby flooding all coastal cities. Still another calls for the complete ban on all organic chemicals in order to safeguard the environment. While governments and international organizations continue to provide the public with information on the current state of the science, the ongoing coverage of interest groups' positions differs widely among the media.

At times, the issue seems overly complex and almost too difficult for most news consumers to easily digest. According to Trumbo (1996), global warming is an intangible issue that is difficult to explain to the average citizen: because of this intangibility and the competing voices in the debate, the public is generally misinformed about the issue. This in spite of the volumes of information and data that have been generated over the last 30 years by the divergent interest groups supporting or denouncing the claim that the earth is at risk. As Corbett (1998b) stated:

> Because of the concern for the environment, thousands of groups and individuals in the U.S. attempt to speak for and about the environment, particularly through the mass media. Politicians, environmental groups, scientists, and corporations all must compete daily for space on the environmental bandwagon (p. 222).

Environmental groups face enormous challenges as they continue to work to assemble and disseminate their facts on the environmental impact of global warming (Edwards, 1998). Ongoing research continues to show that the news media seek out groups or sources that have established credentials, understand the news production norms, are known to the public, and have the resources to continually meet the media's information needs (Ryan, Carrage, & Schwerner, 1998). According to Stempel and Culbertson (1984), "a source's assertiveness, credibility, accessibility, and quotability can affect both a source's prominence and dominance in news coverage" (p. 675). Furthermore, Counts (1975) found that what reporters emphasized in a story was in part due to how "credible they found the source and whether they agreed with the source's message" (p.118).

Given that "most Americans know what they know about the environment from watching television news and reading newspapers" (Salomone, Greenberg, Sandman & Sachsman, 1990, p. 117), and furthermore, that much of what most people discuss about global warming comes from the media, it is important for us to learn more about how the media brings environmental information to the public (Shanahan, Morgan, & Stenbjerre, 1997; Archibald, 1999). The purpose of this study is to use both survey research and content analysis to understand how credible the media perceive environmental groups involved in the global climate debate and the likelihood of using those sources in their reporting.

THEORY

For environmental groups, maintaining public interest in complex issues such as global warming is the key to the survival of the issue and ultimately the groups themselves (McComas & Shanahan, 1999). However, keeping the issue in the public domain takes time, resources, and a keen understanding of how the media affect the public agenda. In this period of media saturation and information overload, the challenge for environmental groups is that the public, the media, and the politicians have little tolerance for exaggerated claims and publicity stunts. The key to achieving public interest is to find the means of interesting the public in the issue. Accordingly, it is crucial that environmental groups find the right communication vehicles to have their voices heard as a means of defining and acting upon social problems (Kielbowicz & Scherer, 1986). "Media coverage can greatly influence the nature, development, and ultimate success" of an environmental issue (Corbett, 1998a, p. 41). According to Ball-Rokeach, Power, Guthrie, and Waring (1990), environmental groups need the media more than the media need them, especially with political issues such as global warming. Even with the explosion of the Internet, a more direct method of communicating with environmental stakeholders and policy makers, the mass media remain "the primary link between the public and the political system" (p. 254).

Gatekeeping

Sources, interest groups, and extra-media social institutions: These are just a few of the forces that scholars have studied over the last 55 years, in an effort to understand "the process by which the vast array of potential news messages are winnowed, shaped,

and prodded into those few that are actually transmitted by the news media" (Shoemaker, Eichholz, Kim, & Wrigley, 2001, p. 233). The study of how media messages are developed and distributed (Donohue, Tichenor, & Olien, 1972) has been likened to a gate whereby the media determine who and what get in and alternatively, who and what doesn't get in. According to Shoemaker et al., (2001), this gatekeeping function of the media either enables or constrains a group's ability to get its message into the public arena. The social reality that begins to be constructed must obviously start with a source of information that has the ability of providing content and context for journalists as they develop or report on an issue such as global warming.

The media are a powerful and important force within society. Some scholars have called the media the main source of information and knowledge (Rogers, 1996), others see them as agents of social control (Shoemaker, 1984), while others view them as the champion of social problems (Yanovitzky & Bennett, 1999). Overall, the media are in a pivotal place to prompt social change either through helping to set the political agenda or by keeping issues and groups out of the public discussion. Because the media are the channels through which information from environmental groups will pass to their key audiences, it is essential that they become a recognized and dependable force in promoting their views on the issue of global warming. According to Shoemaker (1991), interest groups can do this by becoming a force in the gatekeeping process; providing information and messages as a regular part of the media routine and as a result becoming a credible source of ongoing information for the media.

It is a competitive process where sources representing different interests and different agendas attempt to influence the flow of information through the channel. Those

groups that understand the routines of the media, have the ability to provide credible information about a given issue on a timely basis, and are available to produce commentary or analysis, have the opportunity of successfully attaining "newsworthy status" (Roscho, 1975). According to Donohue, Tichenor and Olien (1995), while the media flex their muscles as the news gatekeepers, they are fundamentally dependent on the dominant institutions of society, and their opponents, to make them aware of potentially newsworthy issues. As such, "both sources and gatekeepers benefit from their mutual relationship, with the source getting access to target audiences through the mass media and gatekeepers getting access to someone who can regularly provide credible information" (Shoemaker, 1991, p. 61).

In order for environmental groups to attain "newsworthy status" they must understand the influences and forces that determine the flow of information through the gates of the media. For Sachsman, Sandman, Greenberg, & Salomone (1988), the benefits are clear:

> Environmental news sources that empathize with journalists and are willing to teach reporters about their specific fields can help make mass media coverage of environmental risk as accurate and professional as the American public deserves (pp. 295-296).

Sources

Recent studies have shown that reporters, especially those with a specialization like environmental journalism, have more autonomy in deciding how to cover a story and which sources to use (Mazur & Lee, 1993; Powers & Fico, 1994; Detjen, Fico, Li, & Kim, 2000). As Gans (1979) stated: "sources are the actors whom journalists observe or interview, including interviewees who appear on air or who are quoted" (p. 80). Sources

provide information to reporters about an issue that, according to Shoemaker and Reese (1996), is easy to use and does not consume unnecessary or unavailable resources. Within the global warming debate there are many potential sources that the news media could use to explain, defend or critique a position. The most common are representatives of the sponsoring agency, which in many cases is either a political or a government source, associated with the policy initiative. According to Paletz and Entman (1981), journalists prefer government sources because they are usually available, have something "official" to say, and also understand the routines and pressures of the news production cycle. Furthermore, government sources create a regular stream of "authoritative information that reporters find efficient compared with more labor-intensive research" (Shoemaker & Reese, 1996, p. 130).

In a study of journalists sources of environmental data, 51 per cent of reporters surveyed listed government officials, press releases, and reports as their first source of information, while 25 per cent listed environmental activist groups (Curtin & Rhodenbaugh, 2001, p. 180). While government sources are the preferred means of acquiring information, research indicates that source credibility, accessibility, prominence, knowledge, and deadline pressure ultimately influences the selection of specific sources (Shoemaker, 1991; Powers & Fico, 1994; Shoemaker & Reese, 1996; Curtin & Rhodenbaugh, 2001).

The skill and savvy of environmental groups have obviously increased over the last 30 years since the days when they were informal, citizen groups with limited resources and a lack of understanding of how the media machine operated. While there are still smaller environmental advocacy groups that continue to employ episodic "photo-

op" stunts to gain the media's attention, the majority of environmental groups engaged in the global warming debate have institutionalized their news media relationships and have, on occasion, successfully embedded themselves within the journalistic routine. The question remains however, what makes one environmental group more successful in being used as a source over others in the same debate?

Many journalists want a credible source to comment on a specific issue. Nevertheless, how do they define a credible source? Is it someone who is seen to be unbiased? Is it someone who is known to have certain credentials or holds a specific position of authority? Is it as Ryan, Carrage, and Schwerner (1998) define it "as a group cited in the lead paragraph, as an indication that perhaps it has established credibility as a routine news source" (p. 178)? Finally, is it, as Hovland and Weiss (1953) stated nearly 50 years ago, the group's expertise and trustworthiness?

Credibility

A growing body of communication research has begun to look at the importance of source credibility in the risk communication process. McComas and Trumbo (2001) have taken a traditional mass communication approach and applied it to a series of specific channels and contexts as a means of understanding who or which group has more perceived credibility. Their goal was to develop a method to examine the overall credibility of stakeholders involved in an environmental controversy, ultimately using it as a means to improve or change the method of communication among the stakeholder groups. After an exhaustive review of a series of scales that had been used to measure trust and credibility, McComas and Trumbo settled on an index that was first used nearly

15 years ago to define and measure the credibility of newspapers. The Meyer's Credibility Index (Meyer, 1988) uses five variables that produce strong reliability and face validity in assessing the credibility of a specific "communication source." While a more thorough discussion of the index takes place in the methods section of this paper, the five variables that produced the strongest reliability are whether the source: is fair; unbiased; tells the whole story; is accurate; and finally, can be trusted (pp. 469-470).

Understanding the factors that establish source credibility is critical to an environmental group's ability to become and remain a source for journalists covering environmental issues. As McComas and Trumbo stated: "measuring the believability (credibility) of the source could significantly advance efforts to understand and ultimately improve the process of environmental health and risk communication" (pp. 467-468).

There is limited research on how reporters chose their sources and how sources become "credible sources." As such, this paper is an attempt to extend one element of the gatekeeping theory, namely the use of sources, in an effort to better understand this dynamic and interactive process.

HYPOTHESES

The purpose of this study is to determine how environmental journalists rate the credibility of environmental groups as sources of information on the global warming debate. Furthermore, whether that credibility is evident in the number of stories that the credible environmental groups are used as sources by the reporters. Finally, does the

likeliness of using an environmental group as a source translates into increased media coverage for the group.

H1: The higher that environmental journalists rate an environmental interest group's credibility on the Meyer's Credibility Index, the more likely they will used as a source.

According to Shoemaker (1991), the credibility of an interest group, determined by the group's ability to provide information and messages as part of the news media routine, can result in the group becoming a regular source for the media. To test this hypothesis, journalists were asked to rate all 20 environmental groups on the five component questions of the Meyer's Credibility Index, thereby measuring trust, accuracy, fairness, completeness, and bias of each group. Furthermore, the journalists were asked to assess their likeliness of using each particular environmental group as a source of information on the issue of global warming and climate change.

H2: The higher the Meyer's Credibility score that an environmental interest group achieves, the more media coverage the environmental group will receive.

As Corbett (1998a) stated, the amount of media coverage that an issue receives can virtually determine the success or failure of the issue. Therefore, an important goal for environmental groups supporting a specific issue is to get their message covered by the media. In order to measure the amount of coverage, a Coverage Index was established using three dependent variables as the basis for

the index: total number of articles; total number of paragraphs on the identified environmental group in the articles; and, the number of overall mentions of the environmental group in the articles. To test H2, the Coverage Index was compared to the mean scores that each environmental group received on the Credibility Index.

H3: The more likely that a reporter will use an environmental group as a source the more media coverage the environmental group will receive.

Is perception reality? Does a journalist's awareness of an environmental group, as measured by the likeliness of using that group as a source, result in the amount of coverage that an environmental group receives on a specific issue? This hypothesis was tested by comparing the likeliness of source usage scores to the actual amount of coverage that the group received, as measured by the Coverage Index.

METHOD

A self-administered survey questionnaire and a quantitative content analysis was used to test the credibility and coverage of environmental groups involved in the global warming debate over the last two years. A convenience sample of 20 environmental interest groups was selected on the assumption that the groups varied in credibility. For the purposes of this study, I have accepted Shoemaker and Reese's (1996) definition of an interest group as, "composed of individuals who want to communicate their stance on one or more issues to the public" (p. 184). The groups selected include: the National

Environmental Trust; the Sierra Club; Greenpeace; the Natural Resources Defense Council; Public Citizen; the World Wildlife Fund; the Climate Action Network; the Center on Global Climate Change; the Suzuki Foundation; Kyoto Now!; Ozone Action; Cool the Planet; Climate Voice the Greenhouse Network; the Environmental Defense Fund; Friends of the Earth; the Union of Concerned Scientists; the Earth Liberation Front; Conservation International; and the Audubon Society.

The self-administered survey questionnaire was mailed to all environmental newspaper reporters (N=225), who are members of the Society of Environmental Journalists and reside in the United States. The Society of Environmental Journalists, which has a total membership of more than 1,000 newspaper, television, radio and freelance journalists and academics, is "a professional, educational organization developed to provide journalists of all media who face the challenging responsibility of covering complex environmental issues" a forum for support and information sharing.[1]

The environmental newspaper reporters were asked to rate the credibility of the different environmental groups using the Meyer's Credibility Index (Appendix A). The Meyer's Credibility Index is a five-item index that measures trust, accuracy, fairness, honesty, and bias. Each question is based on a 5-point bipolar scale and the cumulative scores provide a ranking of credibility. The environmental reporters were also asked to rate the likeliness of using the different environmental groups as sources for stories on global warming and climate change. A separate 5-point bipolar scale question ("On the issue of global warming, how likely would you use an environmental group as a

[1] A description of the history and mission of the Society of Environmental Journalists is available at www.sej.org

source?") was used to measure the likeliness of use as a source for environmental journalists.

Using the environmental group as the unit of analysis, a Lexis-Nexis keyword search was conducted for the content analysis using the phrases global warming, climate change, and environmental groups between February 2000 and February 2002. The search resulted in 608 newspaper stories that included the key phrases. All articles published in international newspapers were removed leaving a total population of 356 daily newspaper articles. Finally, all editorials and letters-to-the-editor were removed leaving a total sample of 212 articles from 27 national and regional newspapers[2] that were then analyzed by the author.

To establish intercoder reliability, two coders (the author and a trained second coder) analyzed a small sample of articles (15 per cent of the overall sample, N=30). News stories, features, and news analyses were coded according to a codebook developed for this study. Items appearing on the editorials, opinion columns, and letters-to-the-editor were not coded. Identifiable environmental groups were coded in every applicable paragraph of every article. A source was identified as a group that had a statement attributed to it about the global warming issue. The overall length of the article was coded according to the number of paragraphs in the news article. Intercoder reliability was calculated for each variable using Holsti's coefficient of reliability (CR) and Scott's pi.

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[2] Denver Rocky Mountain News, Washington Post, Boston Globe, Pittsburgh Post-Gazette, Houston Chronicle, Newsday, Minneapolis Star-Tribune, Seattle Times, Hartford Courant, St. Louis Post-Dispatch, New Orleans Times Picayune, San Francisco Chronicle, Columbus Dispatch, LA Times, St. Petersburg Times, Cleveland Plain Dealer, Milwaukee Journal Sentinel, New York Daily News, Omaha World Herald, USA Today, San Diego Union Tribune. Baltimore Sun, Atlanta Journal-Constitution, Denver Post, Chicago Sun-Times, Boston Herald, Buffalo News

Average results for the pre-test coding of the three coverage variables were CR = .92 and Scott's pi = .87[3]

RESULTS

Descriptive Statistics

A total of 28 surveys were returned resulting in an overall response rate of 12 per cent. Sixty-eight per cent were males and 32 per cent were females. The average age of the respondents was 45 years of age (SD = 11.39), with an average of 18.5 years (SD = 11.07) working as a journalist. Thirty-six per cent reported that they were "environmental" reporters while a further 25 per cent considered themselves general news reporters. Fully 39 per cent of all respondents have been covering the environmental beat for 15 or more years while 29 per cent reported covering environmental issues for 6 to 10 years, and 32 per cent have covered the environment for five or fewer years. While 43 per cent of the respondents said that they attended journalism school, 68 per cent said that they did not take any environmental course during their formal education.

When asked whether they had written a story about global warming or climate change, 61 per cent responded that they had written a story about the issue during the last 12 months. Fifty-four per cent of the respondents said that they did use an environmental group as a source of information on global warming or climate change over the last year.

An average of 88 per cent of respondents reported that they did not know five of the twenty environmental groups. As a result, Kyoto Now, Ozone Action, Cool the

[3] Pre-test intercoder reliability results were: total number of paragraphs, CR = .96, Scott's pi = .92; number of paragraphs on the identified environmental group, CR = .88, Scott's pi = .81; number of overall mentions of the identified environmental group in the article, CR = .93, Scott's pi = 89.

Planet, Climate Voice, and the Greenhouse Network were eliminated from the final analysis due to lack of overall knowledge of the groups as reported by the respondents. The remaining 15 environmental groups[4] were included in the final analysis.

Hypothesis Tests

Tables 1 through 3 show the means and standard deviations for the dependent variables (credibility, likeliness of use as a source, and media coverage). The first hypothesis examined the relationship between a reporter's rating of the environmental group's credibility and the likeliness of using that environmental group as a source of information on global warming or climate change. As seen in Table 4, the hypothesis was supported using a Pearson correlation (N=15) between the Credibility Index variables and the likeliness of usage as a source variable ($r = .91$, $p < .01$).

The likeliness of use as a source variable showed a significant correlation between each of the five credibility variables, trust ($r = .92$, $p < .01$), accuracy ($r = .87$, $p < .01$), fairness ($r = .92$, $p < .01$), completeness ($r = .87$, $p < .01$), and bias ($r = .83$, $p < .01$) as seen in Table 4.

Hypothesis 2 explored the relationship between an environmental group's credibility and coverage of the group by the media. This hypothesis was not supported as measured by the relationship between the environmental groups' score on the Credibility Index and the environmental groups' aggregate amount of coverage, as measured by the Coverage Index ($r = -.12$). While reporters ranked Conservation International as the most

[4] Natural Resources Defense Council, Environmental Defense Fund, Union of Concerned Scientists, Sierra Club, Clean Air Trust, Audubon Society, Conservation International, Center on Global Climate Change, World Wildlife Fund, Friends of the Earth, Public Citizen, Climate Action Network, Greenpeace, National Environmental Trust, and Earth Liberation Front.

credible (M = 3.82, SD = .904) among all the groups, as seen in Table 1, Conservation International received the lowest score on the Coverage Index as reported in Table 2. In fact, in all 212 articles Conservation International garnered only two mentions of its name and no direct quotations of its spokespeople. On the other hand, the Sierra Club received the most coverage (Coverage Index = 155) but ranked only 10th on the Credibility Index (M = 3.19, SD = .701). Similarly, Greenpeace ranked second in coverage (Coverage Index = 102.8) but second last in credibility (M = 2.51, SD = .942).

The final hypothesis looked at the relationship between a reporter's likeliness of using an environmental group as a source and the amount of coverage that the group received. This hypothesis was also not supported using a Pearson correlation (N=15) between the likeliness of use as source variable and the coverage variable (r = .09). In Table 3 we can once again see that those groups that received the most coverage, the Sierra Club and Greenpeace also ranked 4th and 13th respectively, in the likeliness of use as a source as seen in Table 4. The Natural Resource Defense Council was most likely to be used as a source (M = 4.11, SD = .751) followed by the Environmental Defense Fund (M = 3.88, SD = .864), and the Union of Concerned Scientists (M = 3.85, SD = 1.10). In terms of coverage, the Natural Resource Defense Council ranked 4th (Coverage Index = 58.4), the Environmental Defense Fund ranked 5th (Coverage Index = 38.9), and the Union of Concerned Scientists ranked 10th (Coverage Index = 14.8).

DISCUSSION

This study examined the relationship between source credibility, likeliness of use as a source, and overall media coverage of environmental groups involved in the global warming and climate change debate. While the initial response rate by environmental reporters to the survey was low, the results do provide empirical evidence that a relationship exists between how credible a source is perceived by environmental newspaper reporters and the likeliness of the source being used by the reporters. These findings suggest that source credibility does have an influence on the perceived selection of sources by the media as Shoemaker (1991) and Shoemaker and Reese (1996) suggested. While the results point to a strong empirical relationship, the overall findings of the study suggest that this relationship may be more ideal than real.

The fact that those environmental groups that received the most coverage, the Sierra Club and Greenpeace, were ranked in the bottom third of credibility suggests that reporters and media institutions use other variables to determine who and what gets covered. Furthermore, while previous research suggested that environmental reporters have more autonomy in selecting sources (Mazur & Lee, 1993; Powers & Fico, 1994; Detjen, Fico, Li, & Kim, 2000), these results suggest otherwise. Much like the findings of source credibility, the reporter's likeliness of using a source in covering the global warming and climate change debate did not translate into higher scores on the Coverage Index for those groups. Once again, while the Sierra Club and Greenpeace topped the coverage charts reporters put them in 4th and 13th place respectively, in the likeliness of using these groups as a source of information.

If it is not the credibility of the environmental group or the likeliness of using the groups as sources that determine media coverage, then what other variables could help explain why some groups garner far greater coverage than others? The answer may lie in the structure and routines of those that achieved the greatest coverage. Both the Sierra Club and Greenpeace, while different in their tactical approaches to environmental issues, could be described as highly structured environmental groups. Therefore, both groups would fit Shoemaker's (1991) description as a force in the gatekeeping process; providing information and messages as a regular part of the media routine. While they may not be perceived as credible and not the most preferred source used by those journalists that responded to the survey, they were very successful in getting their messages covered in the articles that were analyzed for this study.

The structure and ability of the environmental group to garner coverage may also explain why five of the groups did not receive any coverage in the 212 articles or any responses from the surveyed journalists. These groups could be considered less structured and have fewer resources to influence the media routines and, as a result, are unable to compete with the more dominant environmental groups for coverage (Kielbowicz & Scherer, 1986).

The use of the Meyer's Credibility Index brings the measurement of trust, accuracy, fairness completeness, and bias in the mass media almost full circle. When Meyers first developed the instrument in the mid 1980s, its purpose was to measure the credibility of the media in covering local issues. More recently, McComas and Trumbo (2001) used the Credibility Index to examine the credibility of parties involved in a number of risk communication controversies. The use of the Credibility Index in this

study appears to be the first empirical attempt at measuring environmental reporters' perceptions of environmental groups on these five credibility variables.

Limitations and Future Research

The findings from this study are limited by the low response rate to the self-administered survey questionnaire. Furthermore, while there may be some overlap between those environmental reporters whose articles were analyzed in the content analysis and those reporters who were surveyed as members of the Society of Environmental Journalists, this study did not set out to purposely measure specific reporters' perceptions of source credibility and their use of sources in actual newspaper coverage. Further studies on how reporters determine the credibility of sources and the likeliness of using those sources measured by actual analysis of the reporters published stories, would strengthen this line of research.

Table 1. Means (and standard deviations) for indicators of source credibility by environmental group.

GROUP	Trust[1]	Accuracy[2]	Fairness[3]	Completeness[4]	Bias[5]	Meyer's Credibility Index[6]
Conservation International	4.07 (.917) N=14	4.07 (.917) N=14	4.07 (.954) N=13	3.69 (1.11) N=13	3.07 (1.33) N=14	3.82 (.904) N=13
Union of Concerned Scientists	4.03 (.916) N=26	4.15 (.834) N=26	3.81 (.938) N=26	3.77 (1.03) N=26	3.23 (1.07) N=26	3.80 (.849) N=26
Audubon Society	4.04 (.854) N=27	4.07 (.781) N=27	3.89 (1.01) N=27	3.59 (1.01) N=27	3.15 (1.13) N=27	3.75 (.805) N=27
Environmental Defense Fund	4.00 (.693) N=26	4.04 (.720) N=26	3.88 (.766) N=26	3.42 (.902) N=26	3.04 (1.08) N=26	3.68 (.693) N=26
Center on Global Climate Change	4.00 (.633) N=11	3.91 (.539) N=11	3.81 (.603) N=11	3.36 (.809) N=11	3.27 (.905) N=11	3.67n (.531) N=11
Natural Resources Defense Council	4.04 (.759) N=27	4.00 (.734) N=27	3.81 (.736) N=27	3.33 (.877) N=27	2.74 (1.20) N=27	3.59 (.708) N=27
Clean Air Trust	3.78 (.667) N=9	3.44 (.527) N=9	3.56 (.727) N=9	3.22 (.972) N=9	3.00 (1.12) N=9	3.40 (.648) N=9
World Wildlife Fund	3.78 (.736) N=23	3.74 (.689) N=23	3.52 (.665) N=23	3.22 (.851) N=23	2.61 (.988) N=23	3.37 (.598) N=23
Climate Action Network	3.36 (.809) N=11	3.55 (.522) N=11	3.27 (.904) N=11	3.18 (.874) N=11	3.09 (.944) N=11	3.29 (.653) N=11
Sierra Club	3.69 (.928) N=26	3.69 (.679) N=26	3.62 (.804) N=26	2.69 (.928) N=26	2.27 (1.11) N=26	3.19 (.701) N=26

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Table 1. Means (and standard deviations) for indicators of source credibility by environmental group (continued).

GROUP	Trust[1]	Accuracy[2]	Fairness[3]	Completeness[4]	Bias[5]	Meyer's Credibility Index[6]
Public Citizen	3.31 (.630) N=13	3.54 (.660) N=13	3.31 (.751) N=13	3.00 (.853) N=12	2.62 (.961) N=13	3.15 (.661) N=12
Friends of the Earth	3.30 (.979) N=20	3.35 (.933) N=20	3.15 (.933) N=20	2.95 (.945) N=20	2.45 (.945) N=20	3.04 (.778) N=20
National Environmental Trust	3.50 (.535) N=8	3.71 (.488) N=7	3.29 (.756) N=7	2.57 (.535) N=7	1.75 (.463) N=7	2.97 (.439) N=7
Greenpeace	2.81 (1.17) N=26	2.88 (1.11) N=26	2.73 (1.04) N=26	2.27 (1.08) N=26	1.85 (.967) N=26	2.51 (.942) N=26
Earth Liberation Front	1.58 (.693) N=19	1.74 (.991) N=19	1.63 (1.01) N=19	1.26 (.562) N=19	1.21 (.535) N=19	1.48 (.637) N=19

1 Responses were coded 1 = Can't be trusted to 5 = Can be trusted.

2 Responses were coded 1 = Is inaccurate to 5 = Is accurate.

3 Responses were coded 1 = Is unfair to 5 = Is fair.

4 Responses were coded 1 = Doesn't tell the whole story to 5 = Tells the whole story.

5 Responses were coded 1 = Is biased to 5 = Is unbiased.

6 Average of the above 5 variables, Cronbach's alpha range = .80 to .93

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Table 2. Means and Standard Deviation for likeliness of use as source.

GROUP	Mean	Standard Deviation	Number of articles
Natural Resources Defense Council*	4.11	.751	27
Environmental Defense Fund	3.88	.864	26
Union of Concerned Scientists	3.85	1.10	27
Sierra Club	3.65	.892	26
Clean Air Trust	3.60	.699	10
Audubon Society	3.62	1.13	26
Conservation International	3.50	1.26	16
Center on Global Climate Change	3.46	.967	13
World Wildlife Fund	3.30	1.11	23
Friends of the Earth	3.10	1.14	21
Public Citizen	3.00	.961	14
Climate Action Network	3.00	1.00	13
Greenpeace	2.69	1.29	26
National Environmental Trust	2.53	1.41	15
Earth Liberation Front	1.55	.945	20

*Responses were coded: 5 = very likely, 4 =likely, 3 = neither likely nor unlikely, 2 = unlikely, 1 = very unlikely

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Table 3. Means (and Standard Deviations) for indicators of Coverage

GROUP	Number of paragraphs per article[1]	Number of mentions per article[2]	Coverage Index[3]
Sierra Club N=46[4]	1.74 (1.44)	1.63 (1.23)	155.0
Greenpeace N=13	4.46 (5.03)	3.45 (5.54)	102.8
National Environmental Trust N=29	1.30 (.591)	1.03 (.523)	66.9
Natural Resources Defense Council N=23	1.30 (.559)	1.24 (.523)	58.4
Environmental Defense Fund N=14	1.71 (.726)	1.07 (.258)	38.9
World Wildlife Fund N=13	1.46 (.776)	1.06 (.236)	32.8
Clean Air Trust N=10	1.20 (.422)	1.00 (.000)	22.0
Friends of the Earth N=8	1.50 (.756)	1.18 (.405)	21.4
Public Citizen N=6	1.83 (1.17)	1.67 (1.21)	21.0
Union of Concerned Scientists N=6	1.33 (.817)	1.13 (.354)	14.8
Center on Global Climate Change N=4	2.25 (1.89)	1.25 (.500)	14.0
Ozone Action N=4	2.50 (1.73)	1.00 (.000)	14.0
Climate Action Network N=2	5.00 (5.66)	1.00 (.000)	12.0
Audubon Society N=2	2.00 (1.41)	1.40 (.894)	6.8
Conservation International N=1	0.00	1.00	1.00

1 Average number of paragraphs in which the group was mentioned

2 Average number of overall mentions of the group in all sample articles.

3 Sum of means of paragraphs and mentions multiplied by the number of articles about the group

4 Number of articles in which the group was mentioned.

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Table 4. Pearson correlation coefficients for source credibility, likeliness of usage as source, and prominence of coverage.

Variables	Accuracy	Fairness	Complete-ness	Bias	Credibility Index	Likeliness of Usage as source	Number of paragraphs per article	Number of mentions in all articles	Coverage Index[6]
Trust[1]	.98[a] (15)	.99[a] (15)	.94[a] (15)	.83[a] (15)	.98[a] (15)	.92[a] (15)	-.03 (15)	.01 (15)	.01 (15)
Accuracy[1]	---	.98[a] (15)	.93[a] (15)	.80[a] (15)	.97[a] (15)	.87[a] (15)	.02 (15)	.02 (15)	.01 (15)
Fairness[1]		---	.94[a] (15)	.84[a] (15)	.98[a] (15)	.92[a] (15)	-.03 (15)	-.01 (15)	.01 (15)
Complete-ness[1]			---	.94[a] (15)	.98[a] (15)	.87[a] (15)	.02 (15)	-.07 (15)	-.27 (15)
Bias[1]				---	.90[a] (15)	.83[a] (15)	.13 (15)	-.10 (15)	-.38 (15)
Credibility Index[2]					---	.91[a] (15)	.01 (15)	-.04 (15)	-.12 (15)
Likeliness of Usage as source[3]						---	-.01 (15)	.09 (15)	.09 (15)
Number of paragraphs per article[4]							---	.68[a] (15)	.25 (15)
Number of mentions in all articles[5]								---	.60[b] (15)

1 Responses were coded 1 to 5 for each variable.

2 Average of the above 5 variables, Cronbach's alpha range = .80 to .93

3 Responses were coded: 5 = very likely, 4 =likely, 3 = neither likely nor unlikely, 2 = unlikely, 1 = very unlikely.

4 Average number of paragraphs in which the group was mentioned.

5 Number of overall mentions of the group in all sample articles.

6 Sum of means of paragraphs and mentions multiplied by the number of articles about the group.

[a] $p < .01$

[b] $p < .05$

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Appendix A

Meyer's Credibility Index (McComas & Trumbo, 2001)

1. The (***Sierra Club***)* is a possible source of information on the issue of global warming. Considering what you know, please circle the number between the pair of words that best describes your feelings about information from the Sierra Club.

Can't be trusted	1	2	3	4	5	Can be trusted
Is inaccurate	1	2	3	4	5	Is Accurate
Is unfair	1	2	3	4	5	Is fair
Doesn't tell the	1	2	3	4	5	Tells the whole story whole story
Is biased	1	2	3	4	5	Is unbiased

2. On the issue of global warming, how likely are you to use the (***Sierra Club***)* as a source?

Very Unlikely 1 2 3 4 5 Very likely

*Insert name of environmental group

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